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The Contractors' Proposals

WHILE the proposals advanced by Mr. H. M. Drake at the annual dinner of the Electrical Contractors' Association were not considered by the president himself as revolutionary, we think he will agree that they may at least be termed fairly drastic. That opinion will certainly be held by some of the interests concerned, who may also question their practicability in the present position of the supply industry, or in the near future.

The suggestions, which were reported in our last issue (p. 177), are, stated briefly, that the electrical contractors, under the auspices of their Association and in co-operation with E.D.A., should take over all the sales development work from the electricity supply authorities as well as the actual selling of appliances.

Those who believe that a supply authority's sole duty is to generate electricity in the most efficient manner and to distribute it as widely and cheaply as possible, may welcome the scheme as tending towards this end. They may feel that an authority freed from the worries inseparable from development work will be able to concentrate upon its proper business.

Others will ask whether the contractors are competent, as at present organised, to take over what is, after all, the most important aspect of electricity supply to-day. Mr. Drake claimed that they *are* capable in most districts and that suitable arrangements can be made by the E.C.A. where there is any lack.

The supply authorities may want to know, first of all, why E.D.A. has been chosen as the body with which the E.C.A. is to collaborate. They may not be impressed by the support given to E.D.A. by the contractors in past years, and may even go so far as to say that as the providers of E.D.A.'s funds they are entitled to decide what shall be done to speed up development, although they welcome the contractors' assistance in Co-operation Committee No. 2.

They will most certainly wish to be thoroughly convinced that the contractors' performance will implement their very bold promise. It will be urged again, as it has been urged many times before, that one reason for the supply undertakings' incursion into the fields of wiring and retail selling has been the inadequacy or lack of local organisation among contractors. Be this as it may, there are large supply undertakings which have in existence most efficient installation, service and sales departments which are successful because they are part of the undertaking. Should they simply be closed down or should they be taken over by the local organised contractors?

The scheme envisages the continuance of supply authorities' showrooms where these exist, but all sales from them would carry a discount to the contractors, the authorities apparently recovering the cost of running the showrooms from the difference between the large-buyers' discount which they receive and the amount which they will pay out. The only other means would be to get the wherewithal from an increase in the price of energy, which, even though small, would be very undesirable.

The manufacturers of domestic appliances, having agreed that supply authorities are entitled to be treated as "large buyers" under the Fair Trading Policy, will want to be sure that large buying will not cease as a result of the plan—that there will be no falling-off in the demand for their products.

And what of the contractors, some of them at least competent men, who are not members of the E.C.A.? Are they to be forced to join the Association, or if not, how will their fair share of work be determined. In any event, how is the work to be allocated even among the elect themselves? And what of the electricity supply authorities who still stand aloof from E.D.A.?

The consumers, in so far as they are articulate, will wish to be assured that they will still be able to obtain appliances on reasonable hire and hire-purchase terms and that their apparatus will be looked after once the purchase is completed. It is useless to ignore the fact that large numbers of consumers prefer to deal with the supply undertaking for all their requirements.

Mr. Drake was naturally able merely to give a bare outline at the dinner, but it is obvious that all sections will have to do a lot of serious thinking if the lines indicated are to be followed.

Under Ten Million

THE Government still has under consideration the recommendations of the McGowan Committee upon Electricity Distribution which were made public in May last year. No hint has yet been given that the subject is to be raised in Parliament this session. In the meantime, those small supply undertakings whose absorption or amalgamation was proposed are active in the cause of self-preservation. Following upon the London meeting held last year, these undertakings have been grouped in eight areas, in each of which a committee is being set up. These committees, whose activities will be co-ordinated by a central body, are to consider methods for safeguarding the interests of the undertakings whose 1935-36 output did not exceed 10 million kWh. In the meantime, they are wisely seeking means of meeting voluntarily, so far as they can, some of the suggestions made by the McGowan Committee. Such matters as closer co-operation between, and co-ordination of, neighbouring authorities, and uniformity of bulk-supply tariffs and charges to consumers are to be given attention.

Road Safety

THE record of street accidents in Fulham compares favourably with that of most London boroughs, but the Council is not content to leave it at that. The Mayor, when switching on the new lighting system of 452 lamps in eight miles of streets last Monday, made it plain that road safety was the foremost consideration in the decision of the authority to secure the greatest visibility by taking full advantage of the luminous efficiency of mercury-vapour discharge lamps rather than the economy in energy possible with their use, without waiting for pressure from the Ministry of Transport. Mr. W. C. Parker, the borough electrical engineer, has had as his objective the provision of a sharp silhouette against the reflecting background of the road surface, and has attained his end. The installation embodies many distinctive features, such as the use of reinforced-concrete poles and trolley-bus standards. Especially noteworthy is the way in which the numerous bends in the roads (there can be few straight stretches of more than 300 yards) have been dealt with. Yet the illumination of main roads up to a standard that it is to be hoped will become general in future raises even more acutely the problem of guarding against other risks, due to contrast with the low luminous values still maintained in side streets. In Fulham there are 1,700 lamps in these minor traffic channels, as against 487 in the more important thoroughfares. The new lower-wattage discharge lamps should find a very large sphere of usefulness awaiting them.

Limits to Overhead Distribution

THE use of underground cables is often regarded as a concession to the amenities or to the traffic and other requirements of an area in which the number of consumers connected prevents the charges for trench-work becoming an undue burden. The economic case for overhead conductors becomes weaker as the load grows, but co-ordinated information regarding the point at which the advantages of the two systems are equal is not easy to come by. Investigations carried out by Mr. C. E. Schwenger, distribution engineer of the Toronto Hydro-Electric System, and reported in *Electrical West*, show that, while it is physically possible to deal with 20,000 kVA of demand per sq. mile by an overhead network, it pays to convert it to an underground system at about half that figure. This would indicate that if there is any likelihood of a load density approaching 10,000 kVA per sq. mile within a few years of initiating a scheme, cable should be adopted in the first instance. Conditions may differ in Great Britain, and it would be of interest to hear of studies on similar lines that have been undertaken in this country. In Toronto about 25 per cent. is said to have been saved in the cost of wiring large buildings for three-phase four-wire instead of single-phase supplies.

Intangible Goods

THE objects of a research organisation are likely to be defeated if it is expected to yield immediate returns on expenditure. Sometimes, however, striking illustrations can be given of the more obvious results of laboratory work, and the Electrical Research Association is probably well within the margin in claiming credit for 10 per cent. of the annual saving of £700,000 on fuel used in public generating stations averaged over the last ten years, its share representing more than 1,000 per cent. on the subscriptions to its funds. Further gains are to be expected in this field, among others, since the investigations into means of eliminating inter-crystalline failure experienced with molybdenum steel is likely to lead to still more improvements in thermal efficiency of generating stations. Such points will be appreciated by engineers, but it is of equal importance to secure the sympathy of others who are ultimately responsible for financing research. The proposal to invite these to visit Alperton at the time of the general meeting in order that they may see for themselves something of what is going on behind the scenes is an excellent one. It is to be hoped that in this case, at any rate, the idea will yield immediate financial returns.

BRITISH INDUSTRIES FAIR

The next issue of "THE ELECTRICAL REVIEW" will be a special one containing a full guide (with plan) to the electrical exhibits.

We shall be pleased to welcome Home and Overseas visitors at our stand at Birmingham (Cb 808).

Further Generating Plant

IT has been decided to install a fourth 50,000-kW turbo-alternator and two more 125,000 lb. per hr. boilers at Dunston B. station to meet the load for the winter of 1938-39. By the time this is running the frequency change-over on the North-East Coast will, no doubt, be complete, and the station will have an opportunity of demonstrating its capabilities. Its performance will be watched with especial interest in view of the use of inter-stage reheating, the advantages of which at 625 lb. per sq. in. have been disputed. Continued confidence in the system, however, is indicated in the provisions made in respect of the new plant. To have attained third position with a thermal efficiency of 27.25 per cent. in the Commissioners' Fuel Returns with a load factor of less than 40 per cent., as against over 60 per cent. for other stations putting up comparable performances, has been no mean feat. The 25,000-kW turbo-alternator and 200,000 lb. per hr. boiler to be put in at Rotherham will provide an instructive comparison of the progress in design of prime movers. The existing 30,000-kW set (with 50,000-lb. boilers), installed soon after the war, was one of the earliest of its size, and runs at 1,500 r.p.m. with a boiler pressure of 220 lb. per sq. in. A thermal efficiency of about 18 per cent. under these conditions is creditable enough, but the new unit should make an appreciable improvement.

A Safety Razor Factory

Making electrically conditioned double-edged blades by the million

A NOTEWORTHY example of industrial architecture in Sir Bannister Fletcher's handsome style has recently been completed on the Great West Road at Isleworth, Middlesex, for Gillette Industries, Ltd. The imposing three-storey administrative block, dominated by a tall clock tower, is flanked by two wings devoted to the lighter operations of wrapping and packing. Within the three-sided enclosure so formed is concealed the glass-roofed factory proper, all on ground floor level, designed for an ultimate daily output capacity of 25,000 safety razors and 1,500,000 blades. A five-day working week is observed and the employés in offices and factory number about 900.

Much of the processing equipment has been made up by the company itself, for the double-edged blades are manufactured in continuous ribbon form and not severed individually until the sharpened edges have been finished. Time and labour are thus saved, and greater uniformity of quality is assured.

Electricity is purchased from the Heston & Isleworth Corporation and to provide a dual-route supply a three-phase 11,000 V ring main has been looped into a sub-station on the premises. This intake chamber is protected by Pyrene CO_2 fire-extinguishing equipment. The compressed gas is stored in metal bottles behind a dividing wall and conveyed through pipes fitted with appropriately placed injector nozzles. The release of the gas is effected automatically by temperature rise causing the melting of fusible links attached to the ceiling directly above the centrally situated transformers and primary and secondary oil switches, six on either side.

The latter are of the metal-clad Crompton Parkinson vertical isolation type, comprising two ring breakers, a main and metering panel and one breaker each for the three B.E.T. 500-kVA transformers, the output from which passes through six smaller oil breakers to three main 400/230 V distribution boards in the factory. These Drake & Gorham boards consist of sheet-steel enclosures interlocked with air-break switches in conjunction with English Electric cartridge fuses, of from 60 to 300 A ratings, whence radiate internal circuits fitted with metal-clad Sanders and M.E.M. sub-distribution switch and fuse boxes mounted on frames built up of slotted steel supplied by Constructors, Ltd.

The total works load is recorded by a wattmeter in association with a maximum demand alarm instrument, both by Everett Edgcumbe & Co., and the division of the factory electrically into three sections has facilitated the correction of power factor. Two methods of p.f. correction have been adopted. All machines of 10 h.p. and over have individual Dubilier condensers for correcting to 0.98. Two of the three main distribution boards have each a condenser bank for correcting motors of less than 10 h.p. connected to those boards. The smaller motors connected to the third main board are corrected by two (one standby) Crompton Parkinson 70 h.p. auto-synchronous motors operating between unity and 0.85 leading power factor.

[*Elec. Rev. photo.*

This combination of individual and common correction has been found very useful when all the power is "on" at the same time. The load during the working day fluctuates down to 55 per cent. of full-load value chiefly owing to the morning and afternoon breaks allowed to the workpeople. The peak load p.f. is 0.99, and during the working day it varies between 0.98 and a little over 0.99.

The majority of the motors installed are of "Metrovick" make with push button control and Fuller machines with Watford direct-on-line contactor starters. The number of motors installed is 260, totalling 1,010 h.p., in addition to thirty heater fans.

Continuous strip lacquering plant

[*Elec. Rev. photos.*

When received the high-grade steel ribbon from which razor blades are formed is quite soft: it can easily be torn by hand. The first operation is that of perforating the strip to form the longitudinal retaining slot. The strip is then passed between rollers to flatten out any punch burrs before the steel is cleaned by being drawn through I.C.I. degreasing plant, of the trichlorethylene type, arranged for continuous multi-strip operation.

Steel blade-ribbon slotting machines

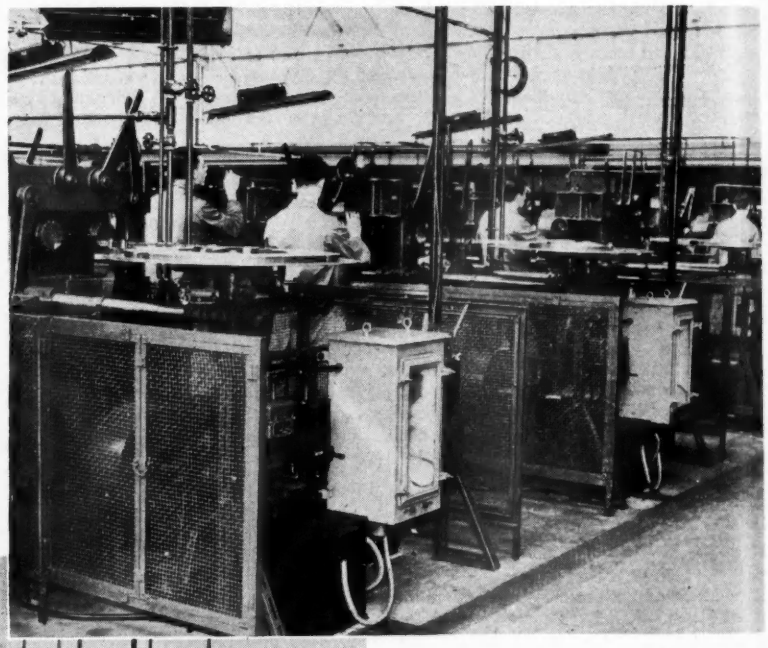
The next process is conditioning in a battery of electric furnaces, each in two sections arranged in end-on bench form with the requisite low-voltage large-current transformers

beneath. The steel ribbon is first hardened by passing it through a tube wound with chrome-nickel heating elements, emerging between water-cooled quenching plates. Tempering is effected by a second low temperature furnace and by passing an electric current through the steel itself. Contact is made at one end by a pair of rolls and broken at the other by a sliding block, oxidisation of the steel strip being prevented by an enclosing tube through which coal-gas flows (consumed by an exit flame).

Temperatures are adjusted automatically by a control board comprising Wilson-Macullen (Foxboro Co.) pyrometer regulators with three-colour lamp indication, Cambridge and Brown graphic recorder, and Sanders and M.E.M. switchgear. This heating and control installation was constructed by the factory staff, the efficacy of the method (which has been patented by the company) being governed by the shape of the blade to be heated.

Trade marks, patent numbers, &c., are now stamped on the steel strip by multiple acid etching machines. A protective coating is applied, beneficial for export purposes, by drawing the strip through a trough of clear or blue lacquer, after which it passes into a Sturtevant stoving oven fitted with electric heating elements (Electric Furnace Co.) and a Cambridge temperature recorder.

The plant for similarly lacquering razor parts in batches is of the chain-conveyor pattern and completely enclosed, with glass side panels, the driving motor operating at an elevated temperature inside. The Revo lighting fittings and all the



Blade-grinding motors with condensers and contactor controllers

[*Elec. Rev. photos.*

"Metrovick" motors in this shop are flame-proof, but the fans in the fume-extracting ducts have less costly protected type motors with their driving shafts passing through glands in a dividing wall.

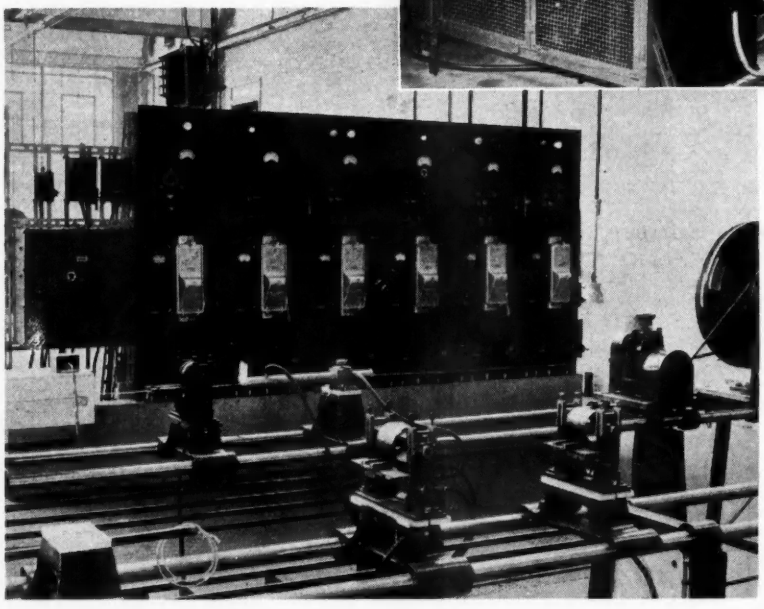
The system of manufacturing blades in ribbon form, each flat strip representing many thousands of blades, enables the double cutting edges to be sharpened more uniformly and very much more speedily by successive degrees of grinding, honing and stropping. These operations are performed by machines with multiple processing heads arranged in line, each having a 20-h.p. squirrel-cage Fuller motor at one end on the floor besides its condenser and Watford direct-on-line contactor starter operated by push buttons from several points along the machine. Auxiliary shafting and belt pulleys are completely enclosed by wire mesh under the machine bed.

This method of drive contrasts with that employed in the central tool room and for the batteries of automatic machine-tools in the opposite section of the factory, which produces razor parts. These are mostly belt driven from overhead line shafting, adequately fenced, with Crompton Parkinson star-delta starters for the motors driving the presses and stamping machines.

To make the six different types of razor produced forty-four individual brass parts are required, entailing 373 operations. As it is necessary that the razors shall be of high-class finish the electroplating section has been equipped with motor-operated Canning vats (stationary and chain-conveyor types) and barrel platers for the electro-deposition of nickel, silver, gold and the very durable rhodium. The associated polishing and buffing shop is equipped with rows of double-ended motors, each row absorbing 30 h.p. Dust from this and other sections of the works is extracted through ducts by a Sturtevant suction filter-bag plant, driven by 22- and 32-h.p. Fuller motors.

Water used for grinding purposes is filtered, the pump motors being float-operated. Compressed air is utilised for blowing oil and water off the blade-grinding machines and for clearing swarf from the presses, &c. In the compressor house there are Fuller motors and the two 70-h.p. Crompton Parkinson auto-synchronous p.f. correcting machines before mentioned. To dry the compressed air, the intake is through refrigerator coils, served by an ammonia compressor driven by a "Metrovick" motor.

Finished blades are wrapped and packed in cartons by batteries of automatic machines, some of Rose Bros.' make, individually driven by small "Century" and "Metrovick" motors. Blade inspection is carried out with the aid of mercury-vapour discharge lamps, while the blade-grinding machines are specially illuminated by Hewittic mercury-vapour tube lamps.



Automatic temperature control board for electric furnaces

General factory lighting is by means of Benjamin and Revo fittings and Siemens-Schuckert enclosed pendants are installed in the offices. The exterior façades and 150-ft. clock tower are floodlighted by thirty-eight G.E.C. 1,000-W projectors, and two exterior neon signs of helium-gold colour have been supplied by Electro-lumination (Abadie Process), Ltd.

Smith's clocks are installed throughout, the four dials in the tower being internally illuminated. There are three Express goods lifts of 220-lb., one-ton and 1.25-ton capacities respectively.

The heavier cables are of Derby make, laid by the Crompton Installation Department, while other cabling and wiring was done partly by Drake & Gorham, Ltd., and largely by the factory staff.

Radio Receiver Performance

A SPECIFICATION for testing and expressing the performance of broadcast radio receivers was discussed at a meeting of the Wireless Section of the Institution of Electrical Engineers in London on February 3rd.

Copies of the specification are obtainable from the secretary of the I.E.E. It deals so far as is possible with overall performance, without attempting to legislate for the electrical response of any individual part. A short introductory paper by Mr. S. Hill explains that the specification has been prepared by manufacturers for manufacturers to provide a definition that will facilitate assessment and comparison of as wide a range of types as is possible. Some omissions have been inevitable. For instance, variable reaction receivers have been excluded because of the impossibility of specifying exactly how the reaction shall be used. Again, with regard to hum, it has been decided that legislation for d.c. mains is too complex to be attempted at present.

The specification has been issued in two separate parts, in order that acceptance of well-recognised electrical tests that can be adopted by manufacturers without any revolutionary changes in their present practice shall not be prejudiced by more controversial acoustic tests which involve the use of special equipment.

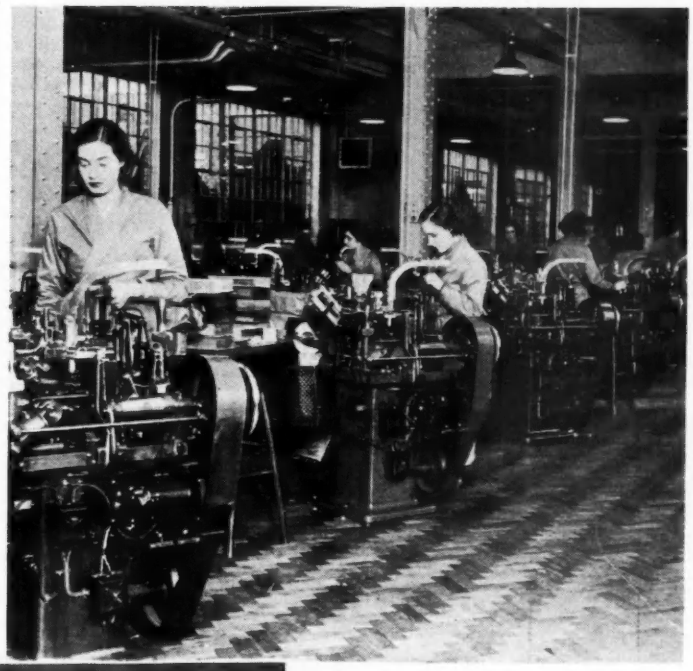
The apparatus called for in the first part is such as most manufacturers are likely to possess, and the accuracies imposed are considered to be well within commercial possibilities. For acoustic tests more elaborate equipment will be needed. The most important item is a heavily damped room, for the construction of which there is no standard procedure.

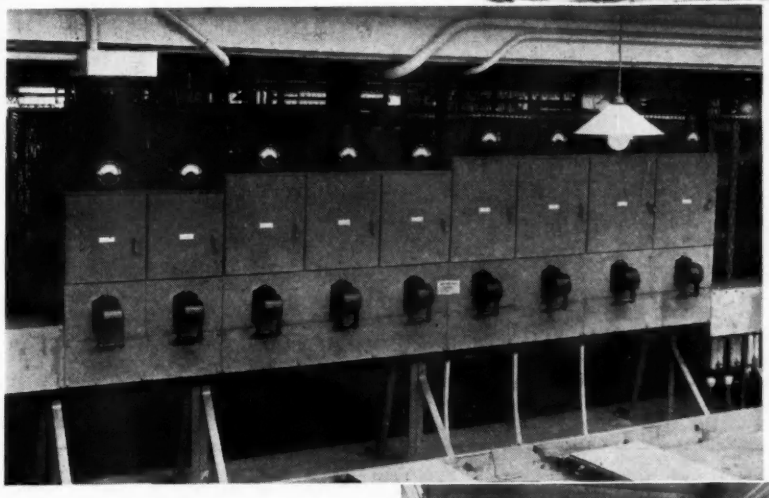
The choice of set-up for measuring acoustic response is likewise left open, so that manufacturers already possessing equipment shall not be obliged to change it. Whatever method is adopted it is expected to be continuous, so that sudden changes of output cannot be missed.

An interesting omission may be noted. No attempt is to be made to measure second-channel and other similar kinds of interference. There are too many types of spurious response to be dealt with individually. The method proposed for expressing sensitivity follows existing practice closely. For determining selectivity two signal generators will be needed. The proposal to measure noise by comparing it with a known single-frequency modulation is perhaps somewhat arbitrary. For this, 1,500 cycle modulation is stipulated in place of 400 cycles in all other cases as likely to be more independent of the degree of tone control.

Provision is made for an overall acoustic-sensitivity test, an element of vagueness being introduced by the use of a dummy aerial. The two series of frequency measurements called for, namely, axial and 45 deg. response, are the remnants of a more ambitious scheme which has been abandoned. Acoustic sensitivity is to be calculated, and it is admitted that the objective method proposed for estimating hum loudness on the assumption of a normal ear is open to several objections.

Distortion is to be measured electrically, but the output corresponding to any distortion is to be stated acoustically.

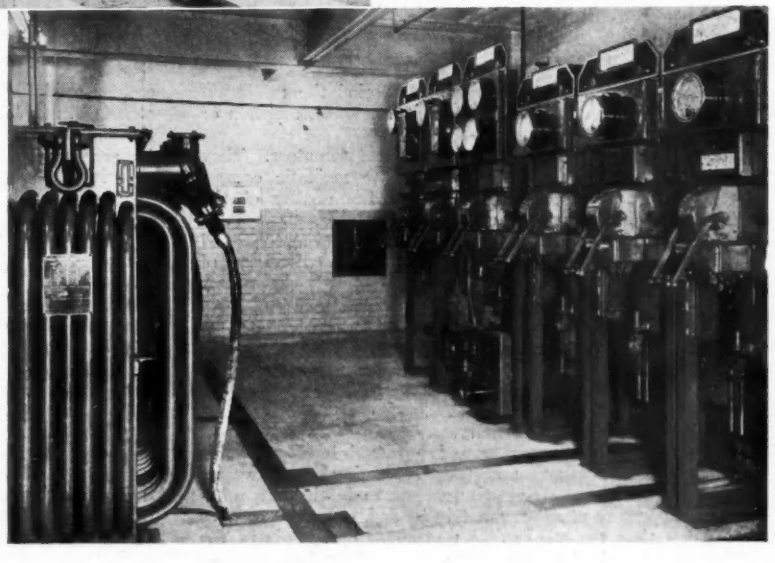




The specification does not attempt to fix any limit of tolerable distortion because its compilers declare that in the present state of the art enough is not known about the relation between harmonic content and the subjective appreciation of distortion. However, it is believed that the higher harmonics are more important than the lower. For this reason the usual r.m.s. measure has been rejected in favour of a weighted distortion factor.

It is not intended that the provisions of this specification shall be final, but manufacturers consider it to be a practical basis.

Further views of Gillette's works. Above: Automatic blade wrapping machines. Left: Typical switch and fuse factory distribution board. Below: Intake sub-station



Greenhouse Heating. By R. W. Klitz, M.I.E.E.

An experimental electrical installation

DURING the tomato-growing seasons of 1933 and 1934 the Electricity Board for Northern Ireland, with the co-operation of a well-established firm of growers, installed 92 kW of tubular heaters rated at 60 W per ft. in two greenhouse bays, each measuring 125 by 30 ft., making up a total floor area of 7,500 sq. ft. The houses were of new construction.

The tubular heaters were suspended on chains so that they could be raised or lowered. This was found particularly convenient for cultivation purposes and the preparation of the soil. The circuits were wired with t.r.s. cables, the flexible connections to the tubular heaters being taken off by means of taped joints, thus avoiding the use of junction boxes and the possibility of condensation troubles. These joints were insulated with pure rubber and black tape and finished with Empire tape and varnished.

Tubular heaters were controlled in one house in groups by circuit thermostats and in the other house by a single radiationstat which controlled a motor-operated oil-immersed switch. Recording thermometers were installed to register both internal and external temperatures and complete records were taken during both tomato-growing seasons.

During the first year the growers elected to work on the basis of a minimum temperature of 60 deg. F., but bright sunlight, even on a cold day, caused very much higher temperatures than this, although at those periods no electricity was being used, so that the average temperature conditions under which the tomatoes were grown were very much higher than the minimum which the electric heating maintained. The only duty of the electric heating was to maintain a minimum temperature of approximately 60 deg., when the outside temperature was as low as freezing point.

The first season ran from the beginning of February until the end of August, 1933. During this period the minimum temperature of 60 deg. was maintained for a consumption of 109,217 kWh.

The growers reported a first-class crop of tomatoes. They found that the heat generated under thermostatic control appeared to have a beneficial effect on the quality of the fruit; that the heating tubes, being removable, allowed for easy and more complete cultivation of the ground and enabled the houses to be more easily adapted for the cultivation of other crops; and that labour costs were practically eliminated. They were, however, rather afraid of the cost because 5/6ths of their total greenhouse area was heated by hot water pipes from boilers and the remaining 1/6th, which was for the time being electrically heated, could be served from the same boilers without appreciable extra expense for labour. In other words, there was nothing but the bare cost of fuel to set off against the cost of electricity.

Nevertheless, the growers were intensely interested in this application of electricity and they determined to carry on through a second tomato-growing season maintaining a minimum temperature of approximately 50 deg. only. They were of opinion that the mechanical movement of the air in the greenhouses might be beneficial and certainly less wasteful than the promotion of circulation by the opening of high ventilators, thereby wasting heat. Accordingly, four small electric fans were installed at the opposite ends of each of the two electrically heated houses.

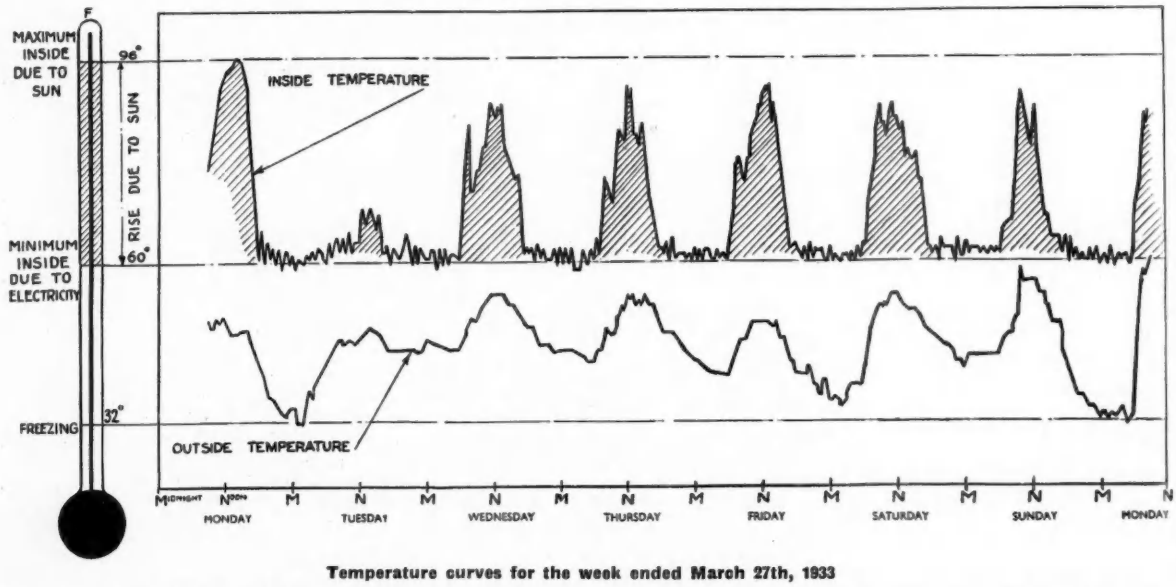
The second season, so far as electricity consumption was concerned, ran from the end of January to the end of June, 1934. Again the growers reported a first-class crop of tomatoes. As a result of the lower minimum temperature of 50 deg., but including the use of the fans, the total consumption of electricity for the season was 40,151 kWh only.

[*Elliott & Fry*

Major R. W. Klitz, who has been sales engineer to the Electricity Board for Northern Ireland since it started trading operations in 1932

During this second season a peak restriction period was introduced whereby the supply of electricity was totally cut off between the hours of 4.30 and 6 p.m. In spite of this the temperature never fell by more than 5 deg. and that only for a very short period on two or three occasions. This peak restriction period was compensated for to some extent by the introduction of time-switch controlled thermostats set for a 60 deg. minimum, to come into operation half an hour before the supply was cut off and half an hour after it was restored.

For a similar section of their greenhouses (7,500 sq. ft.) which was heated by hot water pipes, the growers kept a record of their consumption of solid fuel, the price of coke being 25s. per ton and of anthracite 40s. per ton. The total cost of solid fuel for the first season was returned by them at £36 6s. 2d. They were unable to give any return regarding the consumption of solid fuel for this section alone during the second year. It may be observed that if the second year's electricity consumption (with the peak restriction) is calculated at 0.3d. per kWh, the bill for electricity amounts to only £50 6s. 7d.



Temperature curves for the week ended March 27th, 1933

During the first season the radiationstat which was in single control of one house went out of action for a short period and caused a certain amount of wastage of electricity which was computed to amount to 12,000 kWh, that is to say, the consumption necessary for the first season should have been only 97,217 and not 109,217 kWh. This possibility of wastage due to the failure of a single thermostat seems to be a point in favour of several local circuit thermostats, especially as these gave no serious trouble in the house in which they were installed.

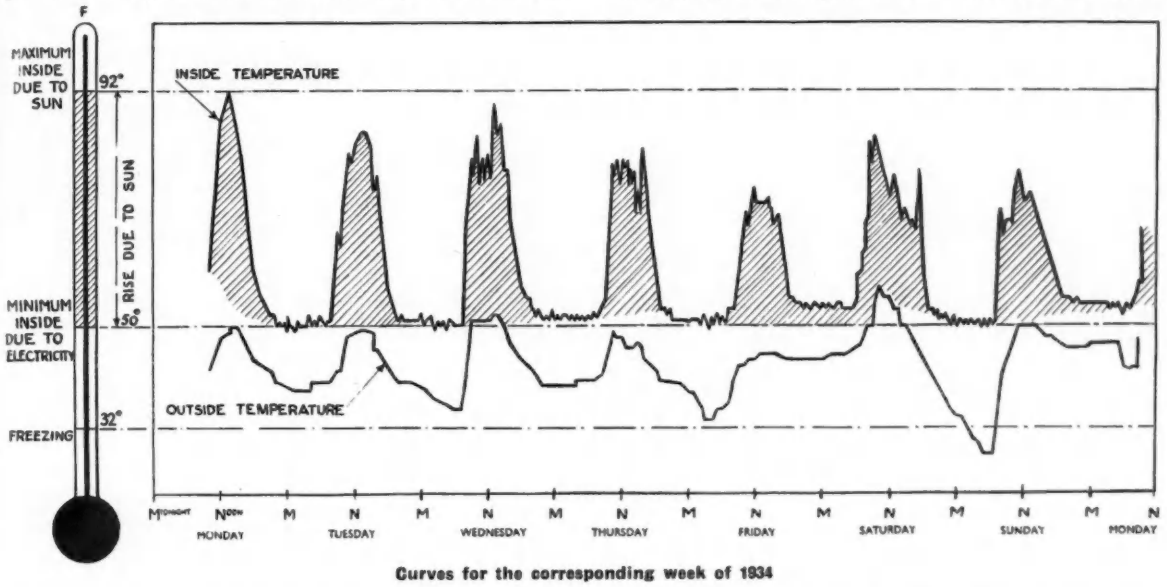
It appears to be difficult to convince many "rule-of-thumb" gardeners and nurserymen that exotic plants can be grown under glass in our latitude provided a minimum temperature of some 50 to 60 deg. is ensured. They generally think in terms of 70 to 80 deg. and it is true, of course, that these higher temperatures do approximate to the *average* tempera-

ture in a heated greenhouse, but they are solely due to sun effect, and after all it is not a uniform high temperature but a wide range of temperature, akin to the natural range in a warm climate, and the total exclusion of anything near frost which such plants require for the fullest promotion of their growth.

Plants feed on sunlight with its accompanying high temperatures, taking in carbon-dioxide, but they also need darkness with lower temperatures, when they give out carbon-dioxide and assimilate the energy they obtain while the sun is up. The day and night processes are continually reversed and to this end a wide range of temperatures is necessary as much as sunlight and darkness.

In the case under review owing to the magnitude of the hot-water installation, it was obviously not an economical proposition for the electrically heated section to be retained, but the records and experience obtained very clearly show that the electrical heating of greenhouses is a sound commercial undertaking if it enables labour to be eliminated and electricity can be purchased at a price that approximates to three kWh for a 1d.

A word of caution is, however, necessary when dealing with the many possessors of greenhouses who have little technical horticultural knowledge. They will be liable to set their thermostats at some fanciful high temperatures and thereby waste a lot of electricity instead of keeping them set at the lowest safe minimum required. It does appear that close regulation by thermostat enables success to be obtained with a lower minimum setting than could be trusted under hot-water heating conditions with a coke-fired boiler.



Curves for the corresponding week of 1934

A Modernised Tannery

Electric drive replaces steam

ALTHOUGH tanneries need a considerable amount of process steam, and consequently some of them, particularly the older ones, employ steam engines to drive their plant, there have been many satisfactory conversions to electricity in recent years.

Until last Easter steam engines provided with reasonable economy the whole of the power required at the big Northampton tannery of the British Chrome Tanning Co. (1909), Ltd. The main engine was of 350 h.p., a 60-h.p. semi-loco type being used for week-end and occasional service. A belt-driven d.c. generator provided the lighting.

A complete electrification scheme was put forward and carried out by the Northampton Electric Light & Power Co., Ltd. Electric drive was adopted on its economic and other merits, and not primarily because of steam plant obsolescence. Although full use was made of the existing transmission system, many tons of the old main shafting and pulleys were removed, thus saving a good deal of space. Group drive was adopted throughout the works, motors ranging from 3 to 45 h.p., the great majority mounted on the walls or on platforms well above the floor so that no useful floor space was sacrificed. In all, twenty motors, totalling 304 h.p., were installed; with one exception these were of Crompton Parkinson manufacture.

Experience with the steam plant provided little useful data as to the capacity of the motors required, and the problem was complicated by the high inertia of some of the long lengths of shafting running in sleeve bearings, especially on cold mornings, which necessitated the use of motors with a high ratio of starting to full-load torque. This difficulty was overcome by the employment on certain drives of "Tork" motors which have a starting torque of up to 80 per cent. more than the corresponding squirrel-cage machines, with the same starting current. This procedure was cheaper than the use of slip-ring motors, and preferable to the installation of squirrel-cage machines of greater h.p. which would normally run underloaded.

The Northampton factory of the British Chrome Tanning Co.

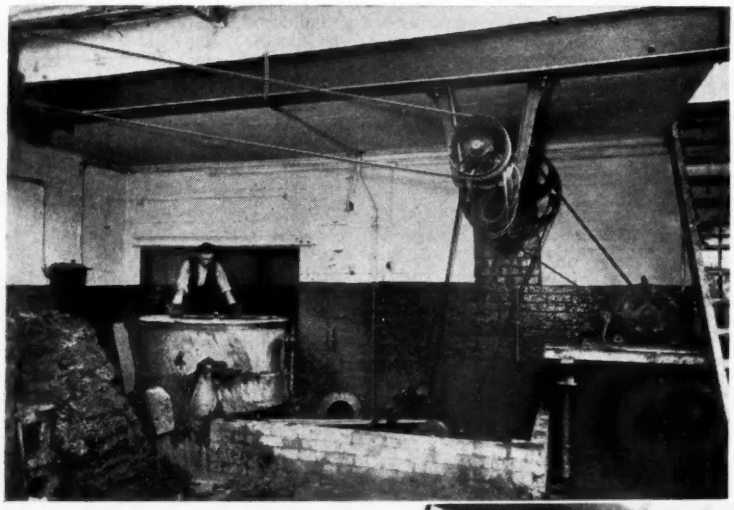
The supply company's estimate of the power required proved to be remarkably accurate, and from the results of the first few months' running it seems probable that its estimate of the annual consumption will be equally close.

Power is taken from the 6.6-kV mains and transformed down to 400/210 V, three-phase, 50 cycles, passing to the works sub-station which is equipped with Ellison draw-out switchgear. The uncorrected power factor of the installation was 0.75, but, the tariff being based on a p.f. above 0.85, a J. & P. condenser was installed in the sub-station, bringing the figure up to about 0.87.

The tannery produces high-class glacé kid for boot and shoe manufacturers, the raw material being dry raw pelts or skins. These are washed, cleaned, freed of hair, tanned, dyed, and finished in a complicated series of operations, many of which involve the use of large volumes of liquid solutions. The air in many sections of the works is, therefore, continuously

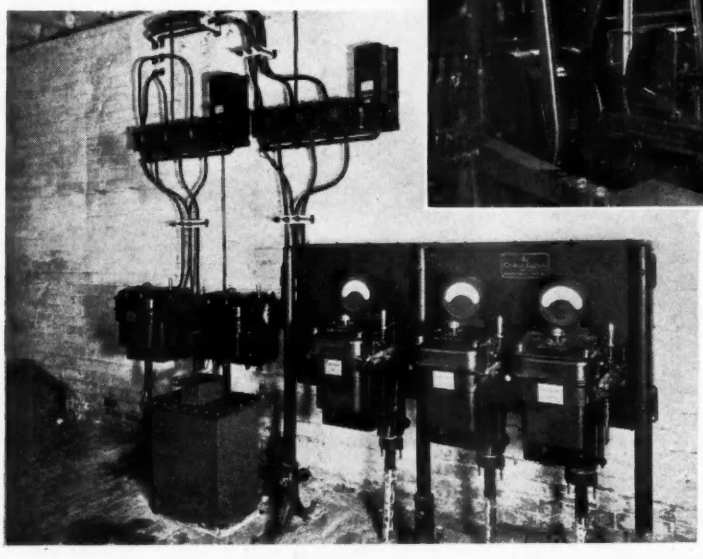
damp, and sometimes laden with corrosive gases, so that the motors have to withstand these conditions.

The process starts with the soaking of the skins and their treatment in a battery of twenty lime paddles, driven by a 10-h.p. 710-r.p.m. squirrel-cage motor mounted on a bracket at shaft level. The final speed of the paddles is about 50 r.p.m. They require about ½ h.p. each, but they are not all in use simultaneously.



Hair-treatment machinery with 20-h.p. drive (above), a 25-h.p. a.c. motor driving twenty-four glazing machines (right), and the sub-station, with Ellison switchgear and J. & P. condenser

The group drive in the "wet shop" is typical of many in the tannery. The motor drives through V-ropes to a flat pulley on the lineshafting, from which a number of drums, scudders and unhairers are driven. The last mentioned incorporate revolving cutters not unlike those on lawn mowers, but much longer, and remove hair from the skin, leaving a clean surface. The hair is washed and dried and sold for felt making and to plasterers. The 20-h.p. motor drives both the washing machine through the lineshafting above, and the centrifuge used for preliminary drying. The same motor also drives a fan on the drying oven in an adjacent chamber.



The only slip-ring motor in the tannery is of 40 h.p., and, like a number of other motors, is mounted on vertical slide rails. Fourteen staking (or stretching) machines are driven from this lineshaft. Arms on these machines come forward and close with a light grip on the leather, which is held in position by the operative. As the arms recede the leather is stretched slightly, the process being repeated many times from different angles on each leather. A somewhat similar drive is employed for a line of twenty-four glazing machines. For convenience the 25-h.p. motor is mounted upside down. It is of the "Tork" type, giving, with star-delta starting, a torque sufficient to overcome the heavy inertia of the machines and shafting.

The colour-dyeing room is one of several sections of the tannery where uninterrupted working is of special importance. Unevenness of colour and other imperfections would almost inevitably result from a stoppage. A 15-h.p., 930-r.p.m. motor is installed in this room, mounted on vertical slide rails. Most of the other drives throughout the tannery are similar in character to those already mentioned. They include the painting machine for spraying lime solution on to the skins (3 h.p.); the "puer" shop, where a line of paddles is driven by a 10-h.p. motor; the experimental room (3 h.p.); the tan house with nine drums (30 h.p.); the black-dye room (25 h.p.); 5 h.p. for a fluffing machine and ventilation fan; 7½ h.p. for gloss spraying and another 7½ h.p. for exhaust fans on drying plant, and 5 h.p. for the engineer's shop. Electricity is also used for ironing the leather during the finishing process. A 210-V lighting supply is taken from tappings on the transformer.

Throughout the works extensive use is made of V-ropes, running in grooves on the driving pulley and on a flat-surfaced pulley on the shaft. This practice has been found by the firm to give very satisfactory results.

The removal of the old steam engines will leave a considerably greater space for productive purposes. The steam boilers remain in use, with natural draught, at a reduced pressure of 75 lb. per sq. in., for raising the process steam for warming liquid solutions, drying, &c.

The work of changing over from steam to electricity was tackled during the Easter week-end by the Northampton Electric Light & Power Co., Ltd.; 60 h.p. of motors was running on the Tuesday morning after the shut down, and the remaining plant by the following day.

Other noteworthy conversions in Northampton that have been carried out by the same company during the past few weeks are: from oil-engine drive, the Spencer Leather Co., six motors totalling 90 h.p.; and from gas-engine drive, Stimpson Bros., Ltd., seven motors totalling 93 h.p.

Counting Tunnel Traffic

To ensure that the ventilation of the tunnel under the River Scheldt between Antwerp and Hoboken is varied in accordance with the number of vehicles passing through it special electrical apparatus has recently been installed which records the number of vehicles in the tunnel, the number passing through in each direction, and, by means of audible and optical signals, indicates the necessary variation to be made in the degree of ventilation. The installation comprises two sets of vehicle-operated detectors for each direction of traffic, with special relays and counting apparatus.

Measuring Instruments.

By E. H. W. Banner, M.Sc., M.I.E.E., F.Inst.P.

Their capabilities and limitations

CLAIMS are made periodically for new patterns of instruments intended to measure everything, or, conversely, to measure any quantity more simply than has hitherto been possible. As a result, the ordinary user has some doubt as to the best instrument to use for a given purpose, and very often he does not know the minimum range attainable with a commercial instrument of a given type. The performance figures given here apply mainly to my own designs of present-day commercial instruments.

Nearly all of the instruments now used follow electromagnetic laws, thermo-e.m.f. instruments being a combination of a thermocouple and a moving coil (electro-magnetic) millivoltmeter. Electrostatic voltmeters are not electromagnetic, but they have little application to general testing, although they are invaluable for certain laboratory measurements and for routine work at very high voltages.

The following is a list of instruments indicating their principal characteristics :—

Type.	Circuit.	Chief Characteristics.
Moving coil	D.C. only.	Polarised ; will show direction of current flow.
Polarised moving iron ...	D.C. only.	Polarised ; cheap.
Moving iron	A.C. and d.c.	Suitable for all power frequencies and for d.c. ; cheaper than moving coil for d.c., but usually less accurate.
Dynamometer (also wattmeter).	A.C. and d.c.	Suitable for all power frequencies and d.c. equally ; good as transfer instrument.
Induction (also wattmeter)	A.C. only.	Limited frequency range ; long scale suitable for switchboard instruments.
Moving coil with rectifier...	A.C. only.	Suitable for power and audio-frequencies ; reads mean value and so has wave-form error ; useful for low ranges and small-power circuits.
Moving coil with thermocouple.	A.C. and d.c.	Suitable for radio-frequencies ; also suitable for other frequencies and for d.c., but is less robust than other types ; has no wave-form error.
Moving coil with thermionic valve.	A.C.	Expensive, but will read on most frequencies with negligible power consumption ; may read r.m.s. or mean value and so may have a wave-form error.
Electrostatic	A.C. and d.c.	Reads volts only ; has no wave-form error ; current indirectly by shunt ; consumes no power.

Basic Design Data

For moving coil instruments the torque expression is $I\,dN/d\theta$, or the current multiplied by the rate of change of line-turns with angle of movement. For a given range and scale deflection the product N, or line-turns, is fixed. Thus, for a given instrument a more powerful magnet needs less power, in milliwatts, from the circuit. In practice the milliwatts are very small, most of the component N being provided by the magnetic lines. The table shows approximately the order of power required by the moving coils of different sized instruments in commercial production. All these are robust double-pivoted instruments.

Miniature sizes (up to 3½in. scale) :		
Ranges from 1 mA upwards ...	100.0 μW, 0.2	ampere-turn
Ranges about 100μA	2.5 μW, 0.06	,,
Ranges about 25μA	0.16μW, 0.016	,,
Larger sizes (up to 8in. scale) ...	1.0 mW, 1.0	,,

Thus as the range is progressively decreased either the torque is decreased at the same rate or the magnetic flux has to be increased. Usually a combination of these factors applies, and a low-range microammeter has a low torque and a heavy magnet. Due to the provision of the magnet and its high contribution to the factor N, moving coil instruments can be made of lower range than can other types, for the same torque. The present minimum is a few microamperes for full scale.

The consumption given above is for the moving coil alone, which is the total for an unshunted milliammeter (except for that lost in the springs); but for shunted ammeters and for voltmeters the total consumption is necessarily increased. A series resistance of negligible temperature-coefficient is necessary in order to reduce the temperature error of the copper coil (0.4 per cent. per deg. C.) to one of about 0.1 per cent. per deg. C., requiring about three times the coil consumption in this resistance. Finally, the consumption of the shunt itself is high for high ranges.

With a volt drop of 75 mV for full scale the shunt loss is proportional to the range as shown below :—

Range		
1 ampere	75.0 mW	
10 ,, ...	750.0 mW	
100 ,, ...	7.5 W	
1,000 ,, ...	75.0 W	

For a voltmeter the total resistance is proportional to the range, and for different movements is as follows :—

Range	100μA	1 mA	10 mA
1 V	0.1 mW	1 mW	10 mW
10 V	1.0 mW	10 mW	100 mW
100 V	10.0 mW	100 mW	1 W
1,000 V	100.0 mW	1 W	10 W
Ohms per volt	10,000	1,000	100

Polarised moving iron instruments are at present little used for serious work, as the moving coil type has almost entirely supplanted it. It is the original Ayrton-Perry type and is used commercially for motor car dashboard ammeters and for cheap watch-pattern instruments. It follows the same basic law as for the moving coil type.

For moving iron instruments the torque expression is $I^2/2 \times dL/d\theta$, where $dL/d\theta$ is the rate of change of inductance with deflection. This is basically a square law, and the torque is produced by the change of inductance of the system as the movement travels. While the law is a square, the scale obtained departs therefrom almost always, as the change of position of the irons rarely leads to a uniform change of inductance; in fact, it is deliberately modified so as to approximate to a linear scale in most instances. There being no magnet to supply energy, all the torque is produced by energy taken from the system. Consequently the consumption is higher and the minimum range usually higher, also, than applies to the moving coil type.

Miniature Types

Miniature sizes need approximately 0.25 VA at 100 ampere-turns and larger sizes 1 VA at 250 ampere-turns. Thus the consumption of a moving iron movement is more than 1,000 times the consumption of the moving coil alone of the moving coil type. If a miniature instrument of range 1 mA is required the coil voltage will be about 250 V, a drop normally far greater than is permissible in a circuit. For voltmeters again a series resistance is required, and this also should be of about three times the coil volt drop for adequate temperature compensation. Such a winding, wound commercially non-reactively, also counteracts frequency error, serving a double purpose.

For ammeters the case is different; the coil can be wound with the necessary number of turns for the range, unlike the moving coil type, where the winding has to be of fine wire. Thus a moving iron ammeter has a constant consumption for any range, although this may be slightly modified commercially, due to the need for using one coil for a band of ranges. For a large moving iron ammeter the consumption will be about 1 VA, or about 0.8 W if used on d.c. If this is compared with the moving coil type it will equal its consumption for a range of about 12 A; for lower ranges the moving coil has the lower consumption and for higher ranges the moving iron. Minimum ranges vary from a few volts and a few milliamperes for miniature instruments to about 10 V and a fraction of an ampere for large instruments.

Modern moving iron instruments are now very greatly improved in all ways over instruments of ten years ago. In addition to reduction of consumption, errors due to hysteresis in the iron and losses in the metal framework near the coil have been appreciably reduced; this leads to improved accuracy over a range of frequencies and also for d.c. The damping of modern instruments is now nearly as good as that of the moving coil type.

For dynamometers, voltmeters and ammeters the same torque expression holds as for the moving iron, but as the dynamometer type usually has an air core, the inductance produced per ampere-turn is less than that for the moving iron, so that the consumption is greater. Such instruments are now not commonly used, except as substandards and for transfer work from a.c. to d.c. where the absence of waveform error with the advantage of r.m.s reading are of application.

Induction voltmeters and ammeters are not commonly employed as test instruments, although they are increasingly used for switchboards owing to their long scale giving improved visibility at a distance. The consumption of the miniature sizes is about 2.5 VA; minimum ranges are therefore higher than those of the moving iron type. The basic law is also that of the moving iron and the square law still holds, being designedly modified in practice to achieve a more nearly linear scale.

The Use of Rectifiers

The good characteristics of the moving coil instrument—low consumption, good damping, linear scale—render it very desirable for a.c. use. The addition of a copper-oxide or other metal rectifier makes this possible without sacrificing much of the low-consumption feature, but it introduces problems of its own. The basic law combines that for the moving coil instrument with the rectifier characteristics, the chief of the latter being that the moving coil instrument reads the mean of the rectified current, whereas for nearly all purposes the r.m.s. value is required. The advantages are low consumption; linear scale except for very low voltage ranges; independence of frequency up to about 20,000 cycles and in some cases 50,000 cycles; good damping; and calibration in mean volts or current without waveform error.

The disadvantages include waveform error, if the current being measured is not sinusoidal; current ranges limited to milliamperes, unless a current transformer is employed. The

waveform error is more serious than it may appear at first sight; as supply mains are generally free from appreciable harmonics it is usually considered that waveform error cannot exist. But in small-power measurements where small transformers and chokes are used the current in the circuit is liable to considerable distortion, which may introduce an error up to 11 per cent. In a particular instance a filament voltage was being measured and while a moving iron voltmeter read correctly a rectifier instrument calibrated in r.m.s. volts read 7 per cent. in error, due to waveform distortion caused by the filament transformer. Low-voltage ranges are limited by two factors, the rectifier volt drop and the rectifier temperature error. The volt drop of the rectifier is a little under 1 V, but for adequate temperature compensation a minimum range of about 10 V is found practicable. Ranges of less than 1 V are obtainable with the aid of a small voltage transformer operating in the reverse way from the usual, *i.e.*, the primary voltage is lower than the secondary.

Thermocouple Instruments

Thermal instruments of the hot-wire type are now not often used except as indicators of aerial current and in other cases where a comparative reading only is required. The thermo-e.m.f. design embodies the law of the moving coil instrument, plus the thermocouple, the latter giving an output proportional to the square of the r.m.s. value of the heater current. In this way the natural scale is square law and true r.m.s. current is indicated. As a type it has a small overload capacity and on that account should not be used when other types are available. It is invaluable for radio-frequencies, and as it may be calibrated on d.c. it is easily checked.

The thermocouple may be electrically in contact with the heater, or it may be insulated; the advantages of the contact type are quicker response while the moving-coil system is not left electrically free, and the advantages of the insulated type include absence of reversal error on d.c., the use of two or more couples in series on one heater and the moving coil out of contact with the high-frequency circuit.

The consumption of thermocouple instruments varies with the range. For one well-known make of thermocouple the output is 6mV, 2mA, and this is sufficient for a reasonably robust miniature instrument and will also serve a laboratory instrument of larger size. The approximate power consumption in the heater for different ranges is as shown below:—

Range	Power
25 mA	0.02 W
100 mA	0.03 W
1 A	0.3 W
5 A	1.25 W
12 A	3.0 W

While thermal ammeters are free from frequency error up to very high frequencies, the same does not apply to voltmeters owing to the difficulty of producing non-reactive resistance at such high frequencies.

For electrostatic voltmeters the basic law for torque is $V^2/2.dC/d\theta$, where $dC/d\theta$ is the rate of change of capacitance with deflection. The square law applies to the scale shape only when $dC/d\theta$ is linear, or, in other words, when the capacitance increases uniformly with the deflection. In practice this is modified to obtain a more uniform scale shape. The law also shows the low-range limitation, as the capacitance has to be increased, and hence the weight, very considerably as the voltage range is reduced. Pivoted instruments are rarely of lower range than 150 or even 250 V.

Testing Sets

For d.c. many moving coil test sets exist. They embody one movement with a switch to read both volts and amperes, or, alternatively, two movements, one in each circuit. Ranges are very wide as the minima can be sufficiently low and the maxima limited only by the space available for series resistance and shunts.

Several a.c./d.c. test sets are now on the market and are of the moving-iron and rectifier types. For a.c. the moving-iron type is very satisfactory, but is limited to some extent by its restricted range, although test sets are available with voltage ranges from 7.5 to 600 and with two self-contained current ranges, an external current transformer being used for higher ranges. The above self-contained ranges can also be used on d.c., a great advantage where the user normally requires to measure a.c., but occasionally d.c. in addition. Another idea is embodied in the change-coil test sets, in which the moving-iron movement is fixed but the coil removable; this can be one of a number of coils to cover a very wide range. Other moving-iron testing instruments have no winding at all, but an iron core with a hinged butt joint which can be closed around the conductor.

The rectifier test set is more popular on account of its width of ranges, which approach those of the moving-coil type for d.c., except that low-voltage ranges are absent and that current ranges usually need a transformer. In the rectifier test set the waveform error is always present.

The induction instrument has also been applied to a test set, and as wattmeters are also made in this type a compact testing set embodying a voltmeter, ammeter and wattmeter is produced. If a moving-iron voltmeter and ammeter are used in such a test set a dynamometer wattmeter is usual. Induction test sets usually require voltage and current transformers as they are not amenable to being made of many ranges. A power-factor indicator may also be combined with the voltmeter, ammeter and wattmeter, and the whole may be wired up to two sets of terminals, one for voltage and one for current.

Ammeters of the clip-on type are now very popular for testing work, and comprise a split iron core with a hinged joint, operated by hand, and either a moving-iron movement in a gap in the core or else a transformer primary on the core, the secondary being connected to an a.c. instrument, either moving iron or rectifier. One of these latter has a voltage winding and a rheostat for adjusting the deflection to a given value; on the application of the line voltage and current simultaneously a resultant is read which is proportional to power factor and so can be directly calibrated. While these are mainly for a.c. use, the "Tong Test," having a moving-iron movement and no transformer, is equally useful on d.c. Ranges are usually from about 10 A to 1,000 A.

The Smaller Undertakings

Progress of opposition movement

THE recommendation of the McGowan Committee that supply undertakings generating less than ten million kWh per year should be absorbed by larger concerns, or amalgamated, naturally aroused the resentment of the undertakings affected.

We have already recorded a meeting held in London at which a decision to oppose the recommendation was made. Mr. A. J. C. de Renzi, the borough electrical engineer of Newcastle-under-Lyme, who convened that meeting has now sent us a report of further activities. The chairman of the movement, as of the London meeting, is Alderman S. Myott, mayor of Newcastle, while Mr. de Renzi is hon. secretary.

The country has now been mapped out into districts with an organising secretary for each. These districts are Yorkshire and North-East Coast; Lancashire and North-West Coast; West Midlands; East Midlands; East Anglia; South Wales; South West; and Southern. A well-attended meeting of delegates from these areas was held in Birmingham on January 21st at which it was decided to set up a Committee of Smaller Municipal Electricity Supply Undertakings to safeguard the interests of these undertakings until such time as the recommendations of the McGowan Report are finally disposd of by legislation or otherwise.

It was considered that it was very necessary for the different areas to voluntarily carry out as far as possible many of the recommendations in the McGowan Report, particularly in so far as closer co-operation and co-ordination between neighbouring authorities in the various areas was concerned, the chief points which should receive serious consideration being: The possibility of uniform bulk supply charges to the various undertakings, uniformity of tariffs, &c.

The secretary reported that the question of uniformity of tariffs, etc., had been under consideration by the engineers of the various supply undertakings in the North-West Midlands Joint Electricity Authority's area for some months past, and as a result it was anticipated that a scheme would be placed before the various authorities in that area at an early date. He further stated that if this scheme was approved by the various authorities, it would be one of the strongest possible arguments against Clause 471 (v) of the McGowan Report which states that:—"Any attempt to carry through a scheme of reorganisation on a voluntary basis is bound to fail and legislation must confer definite and adequate compulsory powers."

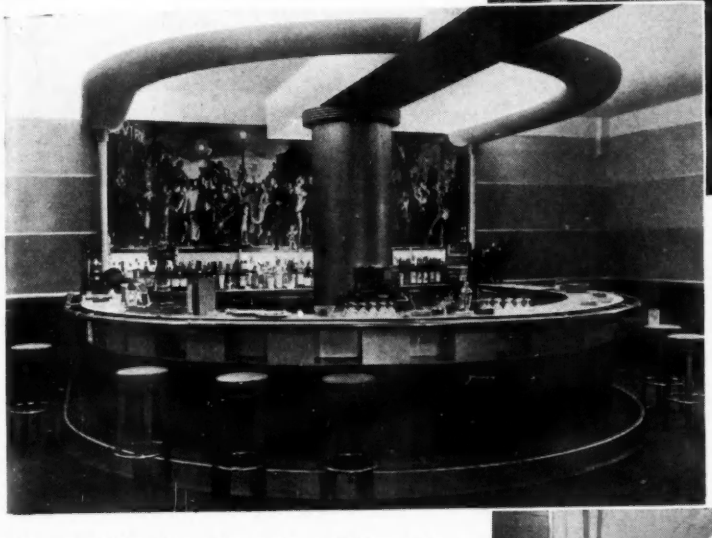
It was resolved that a copy of the North-West Midlands proposals should be forwarded to the district secretaries in the various areas, as soon as it was available.

Mr. de Renzi tells us that although membership of the organisation is confined to municipal undertakings it is the Committee's intention to collaborate closely with the smaller independent company undertakings in all matters in which their interests are identical.

Electricity in London Flats

THE recently completed block of residential flats in Cork Street, Mayfair, known as the "St. Regis," may be described as a smartly appointed apartment house designed to provide a combination of every hotel service with the privacy of self-contained furnished flats.

Electricity is purchased from the St. James' and Pall Mall Co., the total load at present approximating to 1,700 kW. The installation has been carried out by Smith & Hammond, Ltd., largely with G.E.C. equipment, including the main switchboards and distribution gear, two 300-A and six



150-A circuit-breakers, the main switchboard having twenty unit ways. Over 40 miles of Pirelli-General cables and wires have been used, and more than 16 miles of "Silverlac" conduit; 1,200 ft. of verti-type main armoured cable, 70 cable joint

The "St. Regis" flats, Mayfair: Top, the restaurant illuminated indirectly by ceiling troughs. Centre, one of the two bars with architectural lighting. Bottom, electric kitchen with 100 kW of equipment

boxes and 60 floor distribution boards of 60 A per way.

Each private apartment has a tiled bathroom and a kitchenette equipped with a small Jackson cooker as well as an "Electrolux" refrigerator built in under the draining board of the sink. Tenants are charged at a flat rate of 2d. per kWh, without any primary charge, 167 flat control units and C. and H. kWh meters having been provided.

There are some 2,700 "lighting" points and 1,500 switches. Apart from fixed ceiling lamps, 400 lighting plugs and 600 power plugs have been provided; there are also 167 transformers for bells, five complete shop installations, and a luminous indicator service-call system throughout.

Every apartment possesses a telephone and wireless plugs are available also. In the residents' lounge we saw a "Cossor" television set in operation. The all-wave, central aerial distribution system has been installed by E.M.I. Service, Ltd. In the public lounge a news-tape machine has been installed by the Exchange Telegraph Co., Ltd.

The restaurant is served by an electric kitchen containing about 100 kW of G.E.C. and other equipment, including a cooking range with two ovens on each side and hot-plates on top, a two-deck pastry oven, a large griller, two frying outfits, steaming ovens, hot cupboards and a heated service table, three Jackson boilers and a multi-flask "White Cross" (Catering Equipment Co.) coffee making outfit; also a Hobart mincing machine, a potato-peeling machine driven by a Crompton Parkinson motor and a Colt "Autosan" dish-washing machine.

The large kitchen refrigerator is by J. & E. Hall, Ltd., and there are two small cabinets by Kelvinator and Frigidaire, which together with those built-in in tenants' flats total 170 refrigerators in all. Electrically heated Magrini trolleys are used for serving food in private appartments. There are several "Express" passenger and service lifts. The number of motors in the building is 40, totalling 150 h.p. The heating and ventilating plant serving the private apartments is by Chase & Co. and Bull motors drive the circulating pumps for the Danks boilers, which are fitted with S. T. Johnson-Westinghouse rotary oil burners. The air-conditioning plant for the public rooms and restaurant is by Public Utilities (Electric), Ltd.,

[*Elec. Rev.* photos.

and includes a refrigerator compressor driven by a "Century" motor. Sturtevant vacuum plant of the turbine type is installed in the basement with built-in vacuum pipes terminating in wall sockets for the attachment of suction cleaning nozzles in the corridors and apartments.

A "Keepalite" 110-V emergency lighting installation with a battery by the D.P. Co. has been provided. Some 240 ft. of tubular lighting has been used, the public rooms being mostly indirectly illuminated by means of specially shaped ceilings and "Osram" architectural lamps, relieved by wall brackets and luminous corner alcoves of decorative style.

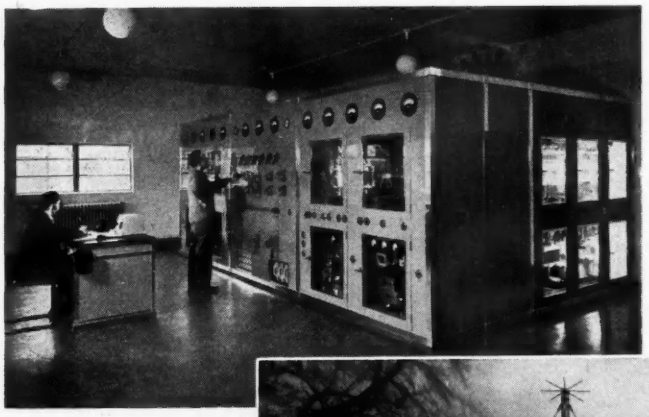
For instance, in the bar illustrated there is a horse-shoe shaped architectural ceiling trough, while the central column contains a glass panel through which light is diffused on to the mural painting. Light tubes behind upright glass sheets on the rear counter direct more light upward on to the wall painting and, at the same time, serve to illuminate the rows of bottles standing on the counter.

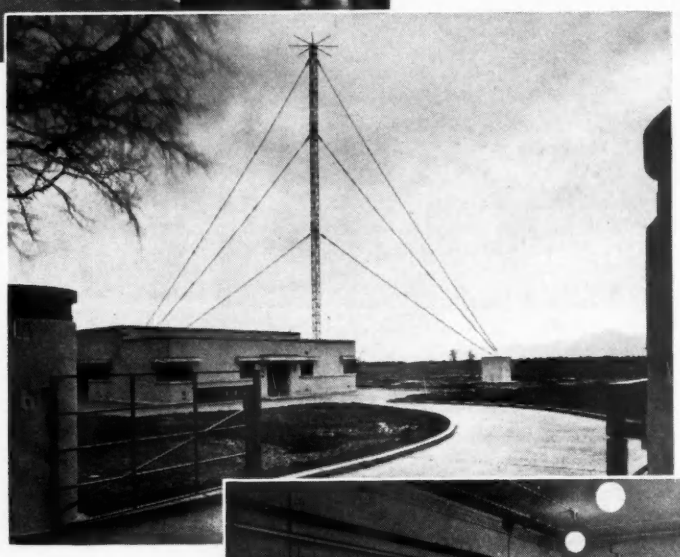
Numerous illuminated direction signs are placed in the entrance hall and "Synchromatic" electric clocks are installed throughout. The exterior is being floodlighted by G.E.C. projectors and "Brilliant" neon signs are being erected.

New B.B.C. Transmitter

To serve North Wales

THE newly constructed transmitting station at Penmon, in Anglesey, which was opened on February 1st, is intended to serve North Wales. It will be synchronised with the Washford transmitter on the latter's wavelength of 373.1 m. (804 kc.) and the programme will be shared until July next, when separate West of England and Welsh regional services will be provided. The new station is the first of the 5-kW type to be built by the British Broadcasting Corporation. In some respects it is a miniature of the stations recently built in Ireland and Scotland, though there are differences in detail and lay-out. The transmitter circuit uses the same system of series modulation, but the controls are mounted on a panel in the centre of the transmitter instead of on a separate desk, and the programme control desk is in the transmitter room instead of in the adjacent control room. The programme is received by land-lines from or *via* Bangor.





The high-frequency input to the Marconi transmitter originates from a valve oscillator, the frequency of which is stabilised by a tuning fork, which is itself controlled by a crystal at Washford, the two being linked by land-line. If an interruption were to occur in the line the Penmon transmitter would continue to be driven by its own fork and the accuracy of synchronisation would depend upon the individual frequency stability of this fork and of the crystal at Washford.

The transmitter is constructed as a single unit sub-divided internally, the glass-panelled doors having a mechanical and electrical interlock system. The programme is passed from the control room to the grid of a low-power low-frequency amplifying valve, which is followed by the modulator stage consisting of two 500-W valves in parallel. The carrier frequency input is applied to a screened grid valve, which is followed by the modulated amplifier stage consisting of two 300-W valves in push-pull. These are in series with the modulator valves and with the source of high voltage, the anode circuit of the modulator valves being connected to the filament circuit of the modulated amplifier valves. Consequently, variations in the impedance of the modulator anode circuit due to low frequency variations of grid voltage cause the effective high voltage applied to the modulated amplifier anodes to vary in sympathy, thus effecting the modulation process.

Next is the main amplifier stage, which utilises two water-cooled valves in push-pull, with spares. The total harmonic content does not exceed 4 per cent. when the carrier is modulated to a depth of 90 per cent. The output circuit of this stage consists of a radio-frequency transformer coupling the balanced anode-tuned circuit to a Marconi transmission line in the form of a concentric tubular feeder having a characteristic impedance of 75 to 80 ohms, which conveys the high-frequency energy to the aerial transformer house near the base of the mast, some distance from the main building. The well water which cools the anodes of the valves in the main amplifying stage forms a closed system and is itself cooled by an outdoor radiator through which air is drawn by a fan. Thermostatic control guards against freezing and there are two motor-driven pumps in parallel. This plant was supplied by John Mullins & Sons. The Radio Communication Co., Ltd., built the mast, which itself radiates the high-frequency energy. It is 250 ft. high and has a capacity ring 40 ft. in diameter at the top. It is of lattice steel construction supported by three sets of stays and is tuned by circuits in the aerial transformer house adjacent to its base. Duplicates of both feeder and aerial tuning apparatus are provided.

A supply of power is taken from the 11,000-V a.c. mains of the North Wales Power Co., Ltd., through a small sub-station adjacent to the transmitter building, and is stepped down to 400 V. The high-voltage apparatus consists of Ferranti and J. & P. main and auxiliary power transformers feeding valve rectifiers, duplicate transformers being provided. The main rectifier consists of six valve and delivers approximately 2 A at 12,000 V, while the auxiliary rectifier consists of three valves and delivers approximately 0.3 A at 5,800 V. The filament heating and grid bias supplies are obtained from motor-generators by the Electric Construction Co., Ltd., duplicate machines being provided in each case. The main filament-heating sets have an output of 225 A at 25 V d.c. and the grid bias sets, each of which consists of a motor driving two generators, have outputs of 1 A at 150 to 300 V and 0.4 A at 350 to 500 V d.c. The filaments of the modulated amplifier valves, which are at a high potential with respect to earth, are heated by an insulated motor-generator.

The transmitter and programme control desk at the Penmon station (top); general view of the station (centre); and the machine room, showing the filament and grid bias motor-generator sets

The switchboards are of G.E.C. make, the batteries of the Chloride type, and condensers were supplied by the T.C.C.; cables and wiring by Marconi's and Drake & Gorham, Ltd.; clocks by the Synchronome Co.; meters by Weston, Ernest Turner and Electrical Instruments, Ltd.; water meters by Electroflo; contactors by the Watford Electric and Manufacturing Co., Ltd.; and lighting fittings by Universal Metal & Neon Works, Ltd.

The night-time service area is anticipated to be, roughly, that to the north-west of a line joining Mostyn on the River Dee estuary and Nevin on the Caernarvonshire coast.

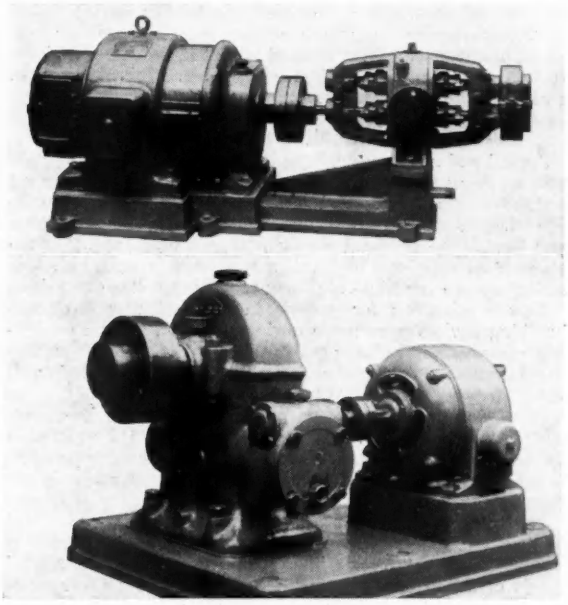
Power Transmission Equipment

Bradford concern's fifty years as manufacturers

THERE is an interesting story of engineering development behind the completion by Crofts (Engineers), Ltd., of fifty years as manufacturers of power transmission equipment. In 1887 the late Mr F. L. Croft established a small workshop in Bradford for the manufacture of wrought-iron pulleys, employing about seven hands. Now the works at Thornbury, Bradford, cover an area of 14 acres and employ 1,200 persons in the production of every type of power transmission equipment embraced by the five classes of drive—direct, belt, rope, chain and gear. The period roughly represents the gradual and progressive change-over from the mechanical prime mover to the electric motor, with considerable impetus imparted to the development by the war and the post-war boom, and leaving still a fair amount to be done.

The present day 14-acre factory of Crofts (Engineers), Ltd.

Because of short-centre individual driving brought about by the electric motor the popular V-rope drive is, we should say, essentially allied electrical equipment. The incorporation of the electric motor in the geared-motor unit, however, now gives the manufacturer a definite claim to membership of the manufacturing section of the electrical industry. It is true, too, that the development of power transmission equipment, particularly by way of speed reduction, has played a fair part in the commercial development of the electric motor itself, for although nowadays the workshop engineer and contractor can, in effect, buy "ready-made speed," the comparatively high speed did appear to be a handicap at one time. We are thinking particularly of the geared motor, the development of which represents an outstanding example of co-operation between motor transmission gear and machinery manufacturers.



"Efficiency" universal geared motor driving pump (top) and double worm reduction gear with motor on common bed

Food manufacturing equipment, machine tools, wood-working machinery, centrifuges and chemical plant all have their incorporated motors, running practically trouble-free and largely dependent on their speed-reduction, and sometimes speed-increasing gears. A few examples of Crofts "Efficiency" geared-motor units are a ¼-h.p., 1,400-r.p.m. motor mounted on a special bedplate incorporating a push-button starter, and driving a mincing machine mounted as an overhang or shaft-extension unit, with a shaft speed of 180 r.p.m.; a heavy-duty motor designed to undertake stresses imposed by overhang loads is a 4-h.p. unit with a 60-1 ratio and a final speed of 25 r.p.m. a universal type incorporating a flanged motor with feet is 1½ h.p. and runs at 1,500 r.p.m., with a 10-1 ratio; a 3-h.p. universal multi-speed equipment has motor speeds of 920 r.p.m. and 460 r.p.m. and final output speeds 664 r.p.m., 332 r.p.m., 148 r.p.m. and 74 r.p.m.; a vertical unit has a ¾-h.p. motor mounted on a standard worm - reduction gear, the first stage reduction being 1,500 r.p.m. to 90 r.p.m. through the "Efficiency" unit, while the second stage reduction is 90 r.p.m. to 1.8 r.p.m. through the worm reduction.

A double worm-reduction gear mounted with its 2½-h.p., 1,500-r.p.m. motor on a common bedplate has a 150-1 speed ratio. The "Radiation" fan-cooled worm-geared motor is so arranged that the gear case supports the motor, while the gear employs a large capacity fan which directs a flow of cool air along the ribs on the exterior of the gear case. The sizes of the equipments mentioned are in no way indicative of the ranges of the types of equipments, either for power outputs or speed ratios. The "Efficiency" range, for instance, covers from $\frac{1}{6}$ h.p. to 40 h.p., and speed ratios up to 83-1 Helical - geared motors are made in sizes from 1 to 120 h.p., with ratios up to 10.1. Wormed geared motors are available in sizes up to 65 h.p., with up to 60-1 ratios, while light power worm-geared motors are made for similar ratios in sizes up to 6 h.p.

The building in which the original business was established

On account of the moving members of the company's grooved variable-speed pulley speed is varied by the "depth" of the belt in the groove, and this can be arranged for hand operation by varying the position of the motor on its sliding base by means of a hand wheel, or automatically. An interesting application of automatic drive is to a worsted winding machine where 5 h.p. is transmitted at a motor speed of 955 r.p.m. and infinite speed variation is available on the machine shaft between 590 r.p.m. and 1,180 r.p.m. By fitting a variable speed pulley on to its shaft any standard motor may be converted into a variable-speed unit, at the same time enjoying the normal reducing or increasing advantages of the ordinary belt or rope drive.

The latest friction clutch development is the multiple-disc ball-operated clutch which is designed for incorporation in all classes of machine tools and employs neither levers nor pins.

Electrical Research

The E.R.A. Report for 1936

THE sixteenth annual report of the British Electrical and Allied Industries Research Association shows that during 1936 there was a voluntary increase of about 50 per cent. in manufacturers' subscriptions and several firms made substantial gifts in addition, which attracted a corresponding pound-per-pound grant from the Government. Nevertheless, the Association is not yet able to take full advantage of the Government offer.

The accounts show a small excess of income over expenditure for 1936, during which year £19,000 was contributed by the Department of Scientific and Industrial Research, £29,689 by the electricity supply industry and £15,851 by manufacturers, plus £3,162 unclassified.

The Association is beginning to obtain the intended benefit from the centralisation and co-ordination of its staff work, which was made possible by the building of the new laboratory. This absorbed most of the reserve fund, which now amounts only to £10,000. Steps have been taken to re-establish this fund for future developments of the laboratory.

A Safety Problems Section has been formed, capable of working in parallel with the Institution of Electrical Engineers, the British Standards Institution and others on problems which may otherwise be nobody's business. The section is planning work on fire extinction in relation to the particular requirements of the electrical industry.

More than one solution has been found in the laboratory of the problem of producing a more reliable bottom bearing for integrating wattmeters at a commercial cost, aimed to decrease heavy maintenance costs and loss of revenue from slow running meters. These results should be brought into full use in the near future. Special methods required for the study of transformer noise at its source are now rapidly yielding data for the guidance of the designer. The study of noise in relation to building structures is progressing, and the Association is in a position to give some help to those actively concerned if they would but co-operate more closely.

Insulating Materials

Valuable information is emerging from the fundamental work on dielectrics in general which is being carried on at the National Physical Laboratory. One aspect of this work which is of considerable significance, both theoretical and practical, is the ionisation which appears to occur in almost all dielectrics at high voltage gradients and is manifested by an increase of power factor or conductance with voltage at a certain critical value. The law connecting critical voltage and thickness suggests a process of ionisation by collision, but there are curious differences between a.c. and d.c. properties, which invite further investigation.

Dielectric materials of the most diverse types available, whose properties were examined during the year, include frequentite, one of the new ceramic materials made for ultra-short wave work, several glasses, a wax, and mixed dielectrics of known composition. The range of frequency covered by the investigation has been greatly extended, and now covers the whole range of working frequencies from the lowest possible up to 10^8 cycles. Reports on this work are in preparation. The general trend of all the fundamental research on dielectrics so far carried out has been to suggest that several different molecular, ionic, or electronic processes contribute to the power losses which occur in practice. One of the main objects of these investigations is to discriminate between these processes in the various types of insulating materials available.

The committee dealing with porcelain insulators was reconstituted during the year, and has since been dealing with the behaviour, testing and control of insulators in service.

Cables

At the request of the Institution of Electrical Engineers, current rating tables have been prepared for both v.i.r. and paper-insulated cables (based on temperature limits proposed for revised Wiring Regulations) which include reduction factors for current ratings for ambient temperature exceeding 25 deg. C. Three- and four-core cables have practically the same current-carrying capacity as six single-core cables of the same size bunched together. Reduction factors for current ratings have been computed for various numbers of v.i.r. cables (up to twenty) run in one conduit. Model tests to determine the geometric factors of three-core cables have been completed, and it was also found that the reduction in thermal resistance due to screening is less affected by variation in the ratio of insulation thickness to core diameter in the case of shaped conductor cables than in cables with circular conductors.

The computations of the new ratings for cables buried in the soil have been completed with certain minor exceptions. A report will shortly be issued to members which deals with the general theory of cables laid in ducts and gives methods for the calculation of current ratings with a sufficient degree of accuracy for any given installation by the methods set out. The minimum length of duct (relative to the depth at which it is laid) beyond which derating is necessary is also deduced.

Research is being carried out on a plain lead-sheathed cable in a duct line to ascertain the movement of a cable when subjected to traffic vibration. Also it has been ascertained that damage to cables in ducts is experienced on the majority of the systems examined. The most serious trouble is the result of forces arising from temperature change due to intermittent loading, and is mainly confined to damage to the sheaths of unarmoured cables. In general, the damage cannot be ascribed to overloading, as failures frequently occur in cables being used within the recognised current ratings.

Investigation on thermal resistivity of soils and cables has shown that in sandy soil seasonal increase coincides with an increase in ground temperature and a decrease in moisture content, while the decrease in resistivity is accompanied by a decrease in ground temperature and an increase in moisture content.

Cases have occurred in which it was suspected that deterioration of reinforced concrete (poles) was due to stray electric current. Tests are still in progress, but the results to date indicate that in certain circumstances when d.c. is concerned damage may occur.

Protective Earthing

Experiments have been made in a number of districts to compare the relative safety of earthing as now practised, protective multiple earthing (in which the earth continuity conductor in each installation is connected to the neutral conductor at consumers' terminals), and the use of earth leakage switches. The tests indicated that the earth electrode resistances at consumers' premises were so high that in many cases insufficient current would flow on a dead earth to blow a 5-A fuse, and that much greater safety would be ensured by the use of one of the other two systems. The chief criticisms of the protective multiple earthing system are that a dangerous rise of potential of the neutral conductor, and consequently the connected metal frameworks, may take place due to unbalanced loading or the fracture of a neutral distributor or service conductor. These criticisms have been analysed by field tests and theoretical study, and it is concluded that the risks are much less than those which now exist with unsatisfactory earthing. The use of multiple earthing is recommended, subject to compliance with certain conditions.

The investigation on the dangers to cattle from voltage gradient on the surface of the ground near earth electrodes has been extended to cover the case of a locality having a low resistivity surface layer over a high resistivity soil or *vice versa*, and the conclusion reached is that in no case would the voltage gradient be more than 50 per cent. steeper than with a soil of uniform resistivity.

Circuit Breaking

Special and novel means have been developed for controlling and studying the conditions in the arc gap at the important instant of zero pause. The study of slow-period recovery voltage (that is, the voltage reappearing at the end of arcing time and having the ordinary supply frequency) indicates that the phenomena associated with this may in certain cases outweigh in importance the high-frequency restriking voltage transient.

New applications for patents in connection with circuit-breaking devices were made during the year, and an application was also filed to cover the development of a fuse to provide the increased delay action desirable in, for example, small fuses for radio sets.

Mining switchgear tests on pressure piling with hydrogen-acetylene-air mixtures, which were delayed until a suitable safety building was available, are now in progress, the work being done in close co-operation with the Safety in Mines Research Board, whose investigators are conducting the tests.

Preliminary work has already yielded some new and useful information and confirmed the view that bacteria and moulds can be important factors in rapid pitting action and related forms of steam condenser tube corrosion, and that bacterial action was at least partly responsible for the anomalous results obtained in some previous corrosion tests. It is thought that the explanation of their action may be that they produce traces of substances which stimulate the electrode processes, and as the state of knowledge regarding these electrode processes is largely speculative, attention is being given anew to electrochemical work on pitting and related types of corrosion.

Meetings and Discussions

There appeared to be a general feeling at a meeting of the E.P.E.A. last week that welded steam joints were preferable to bolted or riveted joints, when the first report of the Pipe Flanges Research Committee was considered. The burning question of charges for electricity was again raised at last Monday's meeting of the Students' Section of the I.E.E. Various types of controllers for industrial heating installation were dealt with by Mr. D. B. Williamson at an informal I.E.E. meeting on January 25th.

Steam Line Joints

AT a meeting of the London Technical Group of the ELECTRICAL POWER ENGINEERS' ASSOCIATION on January 26th Mr. W. B. Shannon (of the London Power Co.) read a paper on steam line joints. The paper was, in the main, a summary of the first report of the Pipe Flanges Research Committee of the Institution of Mechanical Engineers, with some expression of views on the part of Mr. Shannon, who stated that the problem of steam joint failures in electric power stations, with increasing pressures and temperatures, had of necessity been receiving considerable attention in recent years. The report (of a preliminary nature) suggested that amendments were necessary to B.S.I. specifications and that they should be cancelled meanwhile for temperatures above 850 deg. F. The author described the joints available to-day other than the orthodox type of bolted flanged joints. All-welded joints needed a technique equivalent to that of a proved automatic process. If welding were done manually, directly as the result of the skill of the operator, the quality of welds would always be liable to vary. While there would always be a need for a bolted or alternative type of removable joint, the case for the all-welded pipe joint seemed to be strong.

In the discussion Mr. L. Morton (chairman) remarked that while every credit must be given to the work that had been done in the laboratory he felt that a great deal of the testing of steam joints must be done under practical conditions. Mr. W. E. Howes spoke in favour of the compressed asbestos joint and at the same time advocated the policy of following up joints after their initial tightening. The author said the London Power Co. was willing to try out any joint if those responsible for it could prove that it was reasonably scientifically sound. Power station requirements were ahead of the specifications.

Mr. G. M. S. Sichel said he was disappointed with the report because it dealt with the tightness of joints under what might be termed static conditions, whereas power stations worked under alternate heating and cooling conditions, and many station engineers complained bitterly of heavy maintenance charges due to this cause. Mr. Sichel spoke strongly in favour of welded joints.

Dealing with temperature difference and its effect on joints, Mr. G. A. Plummer mentioned a case in America in which joints to work at 1,980 lb. pressure were surrounded entirely by a box filled with copper dust and having a thin lagging over the box to equalise the temperature through the joint itself. Many American engineers held the view that any bolted or riveted joint was definitely undesirable and should be eliminated whenever possible, and he agreed. Mr. C. H. Armstrong, referring to the difficulty of tightening up, suggested the possibility of a spanner which registered the exact force applied so that the same force could always be used.

Mr. S. F. Boieser also advocated welded joints and said the Detroit Edison Co. had evolved an instrument called the "Arcronograph" which was a mixture of recording voltmeter and an oscillograph. It recorded every bead of metal which was applied to the joint and the moral effect on welders was very great. Whether, however, it was good from the practical point of view he would not like to say.

Electricity Supply Tariffs

THE basis upon which electricity supply tariffs are founded are considered in a paper by Mr. J. F. M. Mellor, which was read before the London Students' Section of the INSTITUTION OF ELECTRICAL ENGINEERS on February 1st.

The author suggests that when it appears that a consumer is asking for the provision of a supply which is greatly in excess of what his demand is likely to be, it may be wise to substitute a rent for kVA provided for, instead of the maximum-demand charge. This will cover the cost of the mains and equipment necessary to supply a stated load.

In the case of a tariff which consists only of an energy charge it is necessary to include a minimum charge to ensure that there will be a return on the expenditure involved in making the supply available even if no energy is used during the year. To guard against a consumer ceasing to take supply before the costs have been met, the agreement to supply him and for him to take supply is made out for a minimum period, say ten years; should the works be closed down before that term has expired then the minimum charge will still have to be paid till the end of the agreed period.

No period of the day or night can be regarded as "off-peak" when making a long-term agreement; the only general reduced tariff for off-peak use should be offered when special apparatus is supplied, such as domestic water heaters and thermal-storage systems, controlled by a time switch maintained by the supply authority, or by a signal sent out from the power station, superimposed on the mains. In neither case would the supply authority guarantee to supply energy to this apparatus at any given time of day, but it would undertake to supply for a fixed number of hours each day, and this it would do at times which would improve its load factor.

The author's conclusion is that standardisation of tariffs is desirable and it might be expected to come about if and when the many small distribution undertakings in this country are amalgamated with the larger authorities.

Industrial Temperature Control.—At the informal meeting of the INSTITUTION OF ELECTRICAL ENGINEERS in London on January 25th, Mr. D. B. Williamson opened a discussion on industrial temperature control, up to 1,000 deg. C. One was apt to think electrically, he said, and overlook the fact that the great volume of industrial heating was still obtained by steam. When electricity was applied heat control could be effected by voltage or by energy regulation, and there were four physical types of controller in service:—Differential expansion of solids, direct expansion of liquids, temperature change of resistance, and thermo-piles or potentiometers. Perhaps the most robust and reliable for common duties was a resistance in conjunction with a Wheatstone bridge. Mr. Williamson related how difficult it often was to find the correct device and, when found, to find a desirable situation for it. Ovens might have no provision for air stirring, while thermometers might meet variations of temperature too sudden for the apparatus to keep up with, so "hunting" resulted. The problems demanded full co-operation between the plant designer, the user and the heat-control experts. Mr. G. L. Woolnough said he preferred the resistance bridge principle to the laboratory instruments, which were generally suspended galvanometers very delicately constructed and susceptible to vibration and impact. Mr. R. W. Griffin said that lack of co-operation from the plant makers often made it desirable to provide an instrument that would merely record what temperature change was occurring and leave the adjustment to some further operation.

Steam Generators.—In the course of the fifth Andrew Laing lecture to the NORTH-EAST COAST INSTITUTION OF ENGINEERS AND SHIPBUILDERS at Newcastle-on-Tyne on January 29th Prof. A. L. Mellanby referred to the tendency in some modern power stations towards the use of one boiler, with very large evaporative capacity, for one turbo-generator. The recent demand for boilers of light weight and small volume with high rates of heat transmission was considered and attention drawn to the fundamental work on heat transmission of Osborne Reynolds, Nicolson and other British scientists. From this it is possible to show how these modern demands can be met and that the use of high gas speeds and forced water circulation enables very high rates of evaporation to be obtained. Following on this general discussion, examples were presented of some of the modern special types of boiler, such as the Velox, Loeffler, Benson and La Mont, and some indication was given of the temperature and stress conditions to which their tubes are subjected.

Data on Luminescence.—The nature of luminescence, meaning both fluorescence and phosphorescence, and the modes of action of numerous substances possessing these properties are described in a long paper by Mr. J. T. Randall (G.E.C. research laboratories, Wembley) that was read before the ROYAL SOCIETY OF ARTS in London on January 27th. Materials are classified and their spectra discussed, the curious effects of temperature and of infra-red radiation being indicated. The author's object is to show that theoretical physics has at last provided a framework on which one may now build, and there are strong reasons for believing that it is on solid foundations. The applications of luminescence are growing. Some of them are mentioned, one of the more important being the use of fluorescent powder coatings for converting into useful visible rays the otherwise useless ultra-violet radiations emitted by vapour discharge and cathode-ray tubes. The luminous efficiency may thus be increased, and possibly, also, the effective colour may be changed or improved.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

Electrical Ironmongers

The tone of your editorial note headed "The Ironmongers Persist" is so characteristic of the curious attitude certain people in the electrical trade adopt towards our Section that I feel bound to reply. Of course, we "persist" and we shall "persist" until short-sighted opposition changes its mind.

You reprove us for keeping our independence because "another independent electrical association is not desirable at a time when there is every reason for unity." Will you kindly say if, in your opinion, the E.C.A. is promoting "unity" by trying, as it is at this very moment, to set up two brand-new "independent associations," one for wireless retailers and the other for electrical retailers?

This, and other aspects of the case, may conveniently be overlooked by those opposed to us: but they are not lost upon electrical ironmongers, and make us think that we are not altogether unwise in preferring to remain masters in our own house, rather than live on sufferance under somebody else's roof.

E. B. HOLLOWAY,
Hon. Sec.,
Electrical Section,
Ironmongers' Federated Association.

Cradley, Staffs, *February 1st.*

Recent Testimonials

Quite a number of employers requiring men insist upon "three recent testimonials." I am sure that this is a great stumbling block to many would-be competitors for change of employment.

Personally, I have had one employer for the past ten years, and upon leaving was given a testimonial under a signature which requires no secondary backing. Actually, unless I apply to subordinates for a testimonial it is impossible for me to comply with the requirements of 90 per cent. of "Situations Vacant" advertisements. Surely the ideal employé rarely can produce *three* recent testimonials. I would be glad to have your readers' observations on this point.

INQUIRER.

January 27th, 1937.

Loughborough College Power Supply

The editorial reference to the above in your January 29th issue, invites a reply from the public supply authority in Loughborough. The note states that it is claimed that a saving of over £3,000 per annum (after allowing for capital charges) is likely to be effected by the adoption of independent generation. A saving of £3,000 on 500,000 kWh represents 1.44d. per kWh.

One of the standard tariffs in the Borough of Loughborough would permit the College to take the whole 500,000 kWh per annum (lighting included) for £3,000 on a load factor of less than 14 per cent. and for approximately £2,000 on a load factor of 25 per cent. However low its generating cost may be, the College cannot effect a saving in excess of the actual price at which the public supply authority could provide all its electrical needs.

J. P. TUCKER.
Borough Electrical Engineer and Manager.

Loughborough, *February 1st.*

I have been interested by the mathematical problem which is presented by the report in your columns of the private generating plant at Loughborough Technical College. It is claimed that the private plant will permit of an annual saving, compared with the public electricity supply, of £3,000 on an annual consumption of 500,000 kWh and an annual load factor which I estimate to be 28.4 per cent.

This would mean that the private plant can generate at 1.44d. per kWh less than the cost of a public electricity supply from, presumably, Loughborough Town Council. But I believe that the flat rate power charge of that undertaking is only 1d. per kWh for all consumption per quarter in excess of 20,000 kWh, and it would follow that the Diesel engine plant will generate at minus 0.4d. per kWh. This function of generating power at less than nothing per kWh is usually reserved exclusively for pass-out or back-pressure steam turbine plants.

I understand that one purpose of the installation is to provide the students of the College with practical experience of the generation of energy by means of Diesel engine plant. As many of these students may subsequently wish to enter the electrical profession on the distribution side, I suggest that the experience gained on the private plant will not provide them with a strong recommendation to any progressive supply undertaking, nor is the experience likely to be of any serious practical use to them in their profession. My own experience, as an engineering student, of a college engine room is that it is a novelty at first but that the novelty changes to disdain as the plant becomes rapidly obsolete. Whilst I do not criticise the policy of the College, I suggest that students would gain a wider experience if a number of small engines were installed for demonstration purposes, each engine being representative of different types of plant.

There are probably some features of this plant, such as the use of rejected heat for building heating, &c., that have not been published in full detail and which would justify the statement that its adoption will save £3,000 per year. I notice, however, that your report states that £160 per year is saved by utilising the rejected heat by means of a Cochran calorifier. I would suggest that the publication of more details of the plant, supported by actual comparative costs between the private plant and the public supply, would be of great interest and value to many of your readers.

J. A. SUMNER.

Wolverhampton, *February 2nd.*

Compulsion for Contractors

The rank and file of *bona fide* electrical contractors have various opinions regarding compulsory regulations and registration. The latest contribution to the subject appeared in the ELECTRICAL REVIEW of January 22nd (page 132) reporting the suggestion that an Installations Board should be set up.

Compulsory registration and regulations are not so far away as many contractors imagine, for each year shows an increase in the number of domestic electrical fatalities brought about by gross breaches of rules by people who have no right to be interfering with installation work.

A number of years ago the National Register of Electrical Installation Contractors was brought into being for the purpose of protecting the public and granting certificates to those who had given evidence of their ability to carry out electrical installation work. Notwithstanding some criticism, we have an excellent set of regulations and if those rules and the principles of the N.R.E.I.C. were strictly observed, the business of an electrical contractor would be, truly, a professional one.

The idea of many laymen is that there is nothing in running cables, &c. They can hardly be blamed for holding that view because all types of people have unfortunately been permitted, and indeed even encouraged by some supply authorities, to carry out installation work. How can such people observe the regulations?

There is an inherent weakness in the voluntary system. Suppose a registered contractor persists in carrying out unsatisfactory work after repeated warnings; he can be expelled from the Register but that does not prevent him from carrying on with his bad work in an unregistered state. The N.R.E.I.C. has fully qualified inspectors who periodically examine the work of registered contractors or those proposed for registration but they have no power to examine the work of thousands outside the Register. A number of supply authorities have rather hampered the progress of the Register and it would appear also that vested interests have delayed the institution of compulsory registration and regulations.

Great credit is due to those enthusiastic gentlemen who have been working quietly but effectively for the Register and the betterment of the industry, and I have no doubt that when the time is opportune we may rely on the wholehearted support of the Institution of Electrical Engineers. There is still some spade work to be done and it is up to all *bona fide* electrical contractors to do all in their power to push forward for compulsory registration and regulations—and, let me repeat, they are not far off.

A. MILNE, A.M.I.E.E.

Glasgow, *January 30th.*

Mine Locomotives

Speaking at a recent meeting in Glasgow attended by mining electrical engineers and colliery managers from all parts of Scotland, Mr. W. E. S. Peach, a mine manager in the employment of the Fife Coal Co., stated that for five years he had been operating battery locomotive haulage at his company's colliery in Fife, and the results had been good. The battery locomotive had proved to be better for their conditions than either a main and tail haulage or an endless haulage. It had handled approximately 407,000 tons of clean coal, or operated about 301,000 ton-miles. In five years there had been only one accident, and that was due to misadventure. Although locomotive haulage underground had been little used in Scotland, there seemed to be a future for this safe and efficient system.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A Low-priced Washer

An entirely new departure for the BRITISH VACUUM CLEANER AND ENGINEERING CO., LTD., Parsons Green Lane, London, S.W.6, is the introduction of a "Goblin" washer. This machine is of light, study construction. It weighs 29 lb. and measures 27 in. high by 18 in. in diameter (external), the tub being 15 in. in diameter. A 150-W a.c. motor drives an agitator which makes a double movement approximately every second. About 3 gal. of water is normally employed for a 5 lb. (dry) wash, although the tub has a total capacity of 6¼ gal. The finish is vitreous enamel and the covered top prevents splashing and the escape of steam: the body is normally earthed through a three-core flexible.

The "Goblin" washing machine with a 6¼-gal. tub

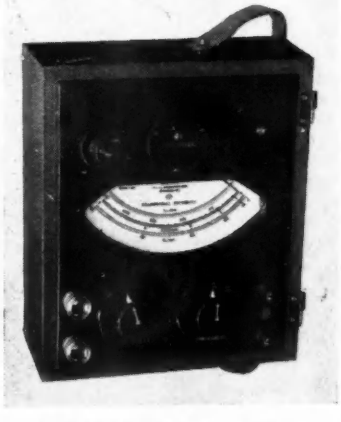
Dish-washing Machines

"Champion" dish-washing machines, for which MEDCALFE & CO., LTD., 141-142, Great Saffron Hill, Charterhouse Street, London, E.C.1, are the distributors in this country, can be obtained fitted with British motors to suit any supply. There are sixteen models with capacities ranging from 2,500 to 21,000 pieces per hour. Three distinct classes of spray machines are available, namely, the rack type, hand feed; rack type, automatic feed; and the belt conveyor type.

An A.c. Test Set

A wide-range dynamometer instrument in a portable teak case with a lid and carrying strap has been added to the products of the CAMBRIDGE INSTRUMENT COMPANY, LTD., 45, Grosvenor Place, S.W.1, as a B.S.S. sub-standard for checking a.c. meters. It may be used as a voltmeter, ammeter or wattmeter, and readings of all three may be made in quick succession without disturbing the connections.

A self-contained volt-range multiplier and a current transformer are operated by range switches marked with maximum values and scale factors. A checking range gives full-scale deflection for 20 mA for a d.c. check on the calibration of the instrument.



The Cambridge a.c. test set

In accordance with a suggestion made by Dr. C. V. Drysdale, a high-grade nickel-iron alloy is employed in the magnetic circuit. The extremely low hysteresis loss of this material, together with features in the design, are claimed to have reduced the frequency and phase-angle errors to negligible quantities, while the sensitivity has been increased to about ten times that of the usual dynamometer movement. The moving system is double-pivoted, and self-screening properties render the instrument practically independent of external fields. Air damping is employed, the pointer coming to rest in 4.5 sec., and parallax errors are eliminated by the use of a knife edge pointer and scale mirror.

As a voltmeter, the instrument may be used on a.c. or d.c., and four ranges rated at 50 ohms per volt from 50 to 500 V full scale are provided. The current transformer provides six a.c. ranges from 0.5 to 25 A full scale. In addition, there is a 0-20 mA range primarily intended for checking the calibration of the instrument. An external current transformer may be connected to the 5-A range for making measurements up to 500 A.

As an a.c. wattmeter there are twenty-four ranges, the scale factor being the product of the volt and ampere scale factors. The power consumed by the instrument is stated to be negligible on all ranges, except the lowest, where a simple correction can be applied.

Room Thermostat

We are informed by the BRITISH THERMOSTAT CO., LTD., Sunbury-on-Thames, Middlesex, that the type "RT" thermostat for rooms has been redesigned to give a maximum capacity of 15 A at 250 V a.c. (1 A at 250 V d.c.) permitting direct control of heating loads up to 4 kW. The standard adjustable scale range is 40/80 deg. Fahr., the differential being 3 deg. Fahr. although a special fine setting of ± 1 deg. is also obtainable.

The "Teddington RT" thermostat

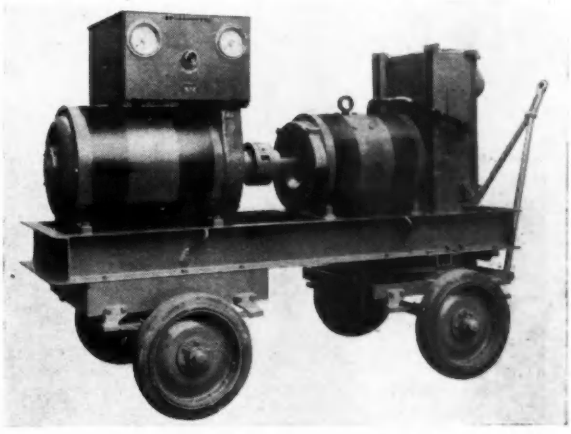
Arc-welding Equipment

Three new types of arc welding plant have been built by MUREX WELDING PROCESSES, LTD., Ferry Lane Works, Forest Rd., E.17, in conformity with British Standard Specification No. 638. All control gear is of the ironclad type.

The first is a Diesel-driven unit for two operators, consisting of two 6-kW, 200-A generators in one carcase and capable of being connected together by a paralleling and equalising switch to give 400 A to one welder for heavy work in conjunction with special electrodes.

The Perkins "Wolff" engine has four cylinders (bore 84 mm., stroke 120.6 mm.) developing 27 h.p. (12-hr. continuous rating) at 1,500 r.p.m. and is cooled by a grilled radiator with belt-driven fan. The fuel passes through Tecalemit and C.A.V. Bosch filters to a fuel pump of the latter make; another Tecalemit filter cleans the lubricating oil, and an "A.C." oil-type air cleaner is fitted to the air-intake pipe. Between the engine and dynamos is a grease-lubricated jaw coupling having renewable friction faces. Above the generators is the control gear, and on each side of the casing are three positive terminals for 50, 100 and 200 A, and one negative terminal. Each operator works from a separate side and has his own 4 in. flush-type voltmeter and ammeter.

A Diesel set has been completed for a ship-repairing establishment in Java. Pneumatic-tyred ball-bearing wheels carry the all-welded steel frame, and an automatic trailer brake and a hand parking brake acting on the rear wheels are fitted. A 38-h.p., 1,000-r.p.m. four-cylinder Gardner engine (4¼ in. bore and 6 in. stroke) drives through a solid coupling two compound-wound drooping-characteristic dynamos in tandem which can be paralleled. These supply from 33 to 200 A to two operators. It was stipulated that the temperature rise



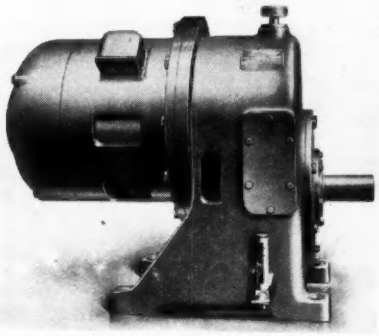
A "Murex" arc-welding set

of each dynamo when delivering 140 A at 40 V should not exceed 30 deg. C. Control is by shunt regulation. Equipment includes a Reliance radiator with a cowled fan driven by Whipple belt from the crankshaft, an engine-driven thermostatically controlled centrifugal pump, a Visco filter for intake air, a Burgess silencer and a Vokes panel-type air filter for dynamo ventilation. Overall dimensions are 11 ft. 7 in. by 5 ft. 5 in. by 8 ft. 3 in. high and the weight, including 18¼ gal. of fuel oil, 4 tons 6 cwt.

D

The third type is electrically driven and the 60-V level-compounded dynamo can supply ten operators. On the back of the steel over-structure are ten positive and ten negative welding terminals; the latter can be joined together for a common return. A motor starter with overload protection, isolating switch and fuses are erected at one end of the set, which is mounted on a welded-steel bedplate, bearing an under-carriage with large diameter rubber-tyred, spring-mounted wheels with swivelling fore-carriage and draw bar. An adjustable handle rotates two laminated copper brushes on each of the ten series resistances; these engage with a slip-ring and commutator-like segments to give smooth action.

A.c. Geared-motor Units



B.T.H. geared 10-h.p. motor with 1,450-483 r.p.m. ratio

The BRITISH THOMSON-HOUSTON Co., Rugby, has put forward a single-reduction helical-gear box specifically to meet the demand for small units with a speed ratio not exceeding 5:1. The new units are at present designed for a.c. slip-ring or squirrel-cage machines up to 10 h.p. at 2½:1 ratio or 5 h.p. at 5:1 ratio. The gear efficiency is slightly higher than that of the company's existing double-reduction units, at least 99 per cent., irrespective of ratio, being claimed. Three sizes of gear box are being manufactured in this type.

The pinions are of nickel-chrome steel, while the gear wheels are cut from solid-forged special steel blanks. The gears are self-lubricating, the large wheel running in an oil bath, while special precautions are taken to prevent oil leakage along either high-speed or output shafts; the motor bearings are grease packed. The units, after being put into commission, need no attention beyond adding a small quantity of oil from time to time to maintain the level necessary as indicated by the oil gauge.

Two of the latest lighting fittings which have been designed by H. G. Richardson, Wordsley, Stourbridge

Coronation Illumination Equipment

FURTHER details of special equipment for the Coronation illuminations come from the Metropolitan-Vickers "Cosmos" Lamp Department, which is listing an attractive range of illuminated displays and a special series of projectors for floodlighting. The illuminated devices are either made of wood and metal or papier mâché and range in size from models 6 ft. high to a small crown less than a foot in height. The large displays depict shields, crowns, banners and scroll-work, together with the royal cypher or a moulded head of the King. They are weatherproof and are illuminated by concealed lamps or small coloured lamps forming part of the design. The smallest display retails at £1 and includes twelve miniature sockets ready wired to a b.c. adaptor and thirteen coloured lamps. Projectors and lamps include coloured lighting and electric-discharge lamps. A catalogue being issued shows typical examples of exterior decoration schemes.

Philips Lamps, Ltd., have also brought out a special series of window and shop displays printed on plywood in strong colours by the silk screen process. The wiring and lamps are easily assembled and the lamps can easily be detached for use after the Coronation for indoor decorations, &c. The designs are particularly suitable for shop windows, counters, and interior wall decoration. This company has two systems of floodlighting available. The "Philora" sodium lamp with its pleasing golden light and the "Philora" mercury lamp with its blue and white light have a high efficiency, long life and low current consumption. Colour filters, which greatly reduce the light output, are unnecessary.

1 and 3. Philips 150-W sodium and F.L.O. floodlights. 2 and 5. Philips C.L.4 and C.L.6 displays. 4 and 6. Met-Vick designs

Indian Electrical Trade

WHILE during 1935-36 India still suffered from the effects of those forces which maintained commodity prices at a very low level, restricted the markets for her produce and depressed the purchasing power of the people, there were definite signs of internal recovery. A further rise of Rs. 2 crores or 2 per cent. to Rs. 134.39 crores in import trade is reported by Sir Thomas M. Ainscough, C.B.E., Senior Trade Commissioner in India and Ceylon, in his report to the Department of Overseas Trade on economic and commercial conditions in India during 1935-36 (Stationery Office, 3s. 6d.).

Sir Thomas states that manufactured goods showed an advance of only Rs. 84 lakhs, although imports of machinery rose by Rs. 111 lakhs and iron and steel by Rs. 84 lakhs. It is significant that the items of manufactured goods that improved were either goods such as machinery, iron and steel, instruments and apparatus, &c., which were necessary for the general expansion of Indian industries which was taking place under the stimulus of the high tariff level, or articles such as electrical appliances of all descriptions, wireless transmitting gear and receiving sets and telegraph and telephone apparatus which reflects the response now being shown by the Indian people to the provision of improved modern facilities. It is somewhat disconcerting to find that the imports from the United Kingdom during the year under review declined from Rs. 53.73 crores to Rs. 52.17 crores or from 40.6 per cent. to 38.8 per cent. In spite of this, however, promising increases took place in most items of the British steel trade, and arrivals of electrical apparatus from this country improved by Rs. 13 lakhs.

Government Buying

In a chapter dealing with the purchases of Government stores in India by the Indian Stores Department, the railway administrations and other departments, details are given of the purchases of engineering and miscellaneous stores during 1935-36, the total value of which amounted during the year to Rs. 4,59,82,622 against Rs. 3,80,50,894 during the preceding twelve months. The values of these stores wholly or partially manufactured in India, for which contracts were placed, amounted to over Rs. 2 crores, representing 45 per cent. of the total value of purchases during the year, the corresponding figure for the previous year being 36 per cent. Electric lamps manufactured by a firm in Calcutta appear in the Department's annual rate contract for the first time. The following list, which we have extracted, gives particulars of the purchases of electrical equipment during the year.

	Rs.
Cables, conductors and transmission line material ...	26,93,000
Electric fans	12,79,000
Electrical fittings and miscellaneous electrical stores ...	10,31,000
Electric lamps	9,40,000
Battery and battery charging equipment	8,41,000
Beacons, floodlight and lighthouse equipment	6,15,000
Train lighting dynamos	5,82,000
Primary cells and elements	3,92,000
Porcelain insulators	2,29,000
Electrodes	1,90,000
Electricity meters	1,16,000
Generating plants, sets and spares	1,03,000
Spares for telephone and signalling apparatus	95,330

Analysis of Imports

In an analysis of the electrical import trade the report shows that imports of electric fans and parts rose from Rs. 25 lakhs to Rs. 32 lakhs, of which the United Kingdom's share was Rs. 22 lakhs. Purchases of electric wire and cables advanced from Rs. 87¼ lakhs to Rs. 93½ lakhs, Great Britain supplying Rs. 71 lakhs. Telegraph and telephone instruments and apparatus, totalling Rs. 18 lakhs, were drawn from the United Kingdom to the amount of Rs. 12½ lakhs. Imports of gas-filled electric lamps increased by Rs. 1 lakh to Rs. 19 lakhs, the United Kingdom sending Rs. 11½ lakhs, while vacuum electric lamps to a total of Rs. 16½ lakhs arrived from Great Britain (Rs. 6 lakhs), Holland (Rs. 4½ lakhs), and Japan (Rs. 4 lakhs). Electric lamps (other sorts), totalled Rs. 11 lakhs but while China and the United States sent Rs. 4 lakhs each, the United Kingdom's share was only Rs. ½ lakh.

The value of imported wireless valves was Rs. 86,000, of which Rs. 58,000 was British. Batteries imported aggregated Rs. 20½ lakhs, the United States accounting for Rs. 16 lakhs and Great Britain for Rs. 2 lakhs, while the United Kingdom's share of accumulators amounted to Rs. 7 lakhs, leaving only Rs. ½ lakh from other countries. Electric lighting accessories and fittings (including switches) totalled Rs. 8 lakhs, of which the British share was Rs. 4¼ lakhs and the German Rs. 2 lakhs. Imports of meters, totalling Rs. 10½ lakhs, were obtained from the United Kingdom (Rs. 5½ lakhs) and Germany (Rs. 3 lakhs), while the value of other miscellaneous electrical instruments was Rs. 6 lakhs, of which Rs. 4½ lakhs came from Great Britain. With regard to electro-medical apparatus (including X-ray apparatus), imports were valued at Rs. 5 lakhs, the British share being Rs. 1¼ lakh and the United States Rs. 1 lakh. Switchboards (other than telegraph and telephone) were imported to the value of Rs. 4 lakhs, the United Kingdom supplying Rs. 3½ lakhs. Unenumerated electrical goods and apparatus was valued at Rs. 35½ lakhs, of which the United Kingdom's share was Rs. 20½ lakhs The United Kingdom supplied 56 per cent. of the total electrical imports.

Communications

During the year under review the main activities in the cable and wireless services were those of the Indian Radio and Cable Communications Co., which included the wireless beam telegraph services between India and the United Kingdom and between India and Japan, and the cable services from Bombay and Madras to all parts of the world. With regard to the overseas telephone service, there was a steady increase in the number of calls since its inauguration in May, 1933, and the service was extended to Ceylon and through London to most countries of the world.

Two combined radio-telegraph/telephone stations are being installed at Madras and Rangoon respectively to meet the growing demand for speedy inter-communication between India and Burma. The installation was nearly completed at the date of the report. Towards the end of 1935 the installation at Delhi of a 20-kW broadcasting station was completed and since then regular daily broadcasts have been carried out. The growth of air services in and across India has coincided with considerable progress in wireless ground organisation, consisting of transmitting and direction-finding stations.

Future developments in the wireless field are anticipated, particularly in broadcasting. A large sum of money has been voted by the Government for the development of internal broadcasting, and a number of provincial stations are expected to be installed. It is clear that India, during the next few years, will provide a valuable market for suitable receiving sets. So far the trade is almost entirely in the hands of United States and Dutch manufacturers, and only two or three United Kingdom companies have paid any attention to the possibilities of the market. Among the Indian middle classes there is a vast market for cheap sets, but in view of the 40 per cent. duty it is difficult to see how United Kingdom makers can reach a figure sufficiently low, without manufacturing on a large scale in India.

The total imports of radio apparatus (including transmission and receiving apparatus) shows a promising advance from Rs. 16 lakhs in 1934-35 to Rs. 28 lakhs in 1935-36, the United Kingdom supplying Rs. 10.5 lakhs, an advance over the preceding year of Rs. 5.5 lakhs. From 80 per cent. to 90 per cent. of the United Kingdom's shipment consisted of transmission apparatus, representing nearly the whole of this trade.

The Accurate Gauging of Bores

A PNEUMATIC micrometer has recently been adopted for checking the accuracy of ball-race bores on industrial-motor endshields by Laurence, Scott & Electromotors, Ltd. In order to measure the diameter of the bore, a plug is inserted in it, and compressed air is delivered to the plug in such a manner that it escapes through the annular clearance gauge which registers a difference in pressure. The gauge is arranged to give direct visual readings of the accuracy of fit, and is fitted with a scale marked off in ten-thousandths of an inch. The accuracy of the micrometer is unaffected by the pressure of the compressed air supply, and since the plug is a comparatively free fit in the bore, wear on the plug gauge is negligible. The bores have already been finished by diamond boring on Heald "Borematics" so that a high degree of precision is assured, both in the bores themselves, and in the bearing assembly as a whole. Distortion in fitting or while running due to the bore of the ball race being less accurately finished than the race itself is avoided, the tolerances on the two parts being approximately equal.

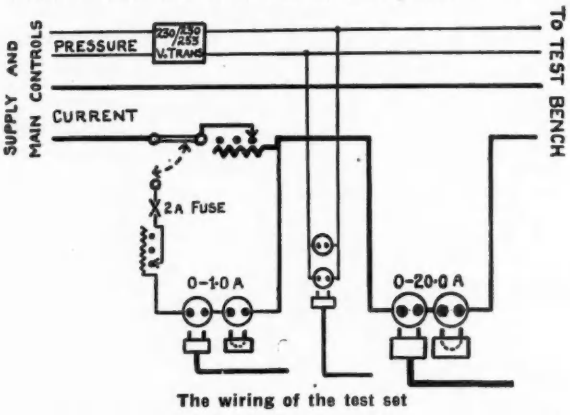
The compressed-air gauge in use

Two-wire Meter Testing. By G. E. Moore, A.M.I.E.E.

A useful arrangement of indicating and integrating apparatus

THE reference watthour instrument on a two-wire meter test-bench must, in my opinion, possess certain features: suitability for the test methods favoured; precision under all load and other conditions; any load-range scheme to be of simple dependable form; visible interior; means for frequent self-checking and for ready examination on the standardising bench; load indicators; and moderate cost.

A routine test method which still finds favour requires, as the equipment, a wattmeter and a stopwatch for short-period disc-tests and also a watthour meter (generally one of commercial form, such as those under test) for the necessary long-period register tests. A simple sub-standard apparatus comprising merely a rotating instrument that can register both disc revolutions and kWh is much to be preferred: the test



The wiring of the test set

bench can throughout be manned by one tester and not only the customary dial tests but disc tests also can be expeditiously and accurately made.

The dependability of the sub-standard is determined by a number of factors. Its electrical, magnetic and mechanical parts must, as it were, be set—thus a modern mass-produced meter, itself well made and well tried, may justifiably be elevated to sub-standard duties. Braking magnets of stable magnetic strength are especially vital; and the avoidance of low sub-standard meter speed, with the possibility of serious frictional effects, is an assurance. It is also worth while to render temperature effects negligible and to guard against any vagrant faults that, by affecting the sub-standard's own circuit, would affect its integrity. Another useful requirement is self-checking, as by duplicate metering; and the periodic reference to standards should be conveniently effected. The provision of a voltmeter and an ammeter is beneficial; occasions arise when these instruments give a welcome clue as to conditions.

The following 230-V, 50-cycle, two-wire instrument set for a 0-20-A size meter test-bench has the features advocated. The instruments are mounted on a stand having a hollow panel made of two meter boards. Two sub-standard meters are used. They are ordinary "Sangamo" meters, with temperature compensation as an "extra," and specially examined. Each has a distinctive glass cover; and each has a disc marked off in tenths and hundredths and a register which indicates both disc revolutions and kWh (described in the ELECTRICAL REVIEW of May 31st, 1935). One meter is 1 A and the other 10 A in nominal size; each is capable of 200 per cent. load with the modern "flat curve" up to this load, but only the 10-A meter is run up to double load. In series with the appropriate meters are 1.0-A and 20.0-A ammeters, and between these indicating instruments is a 0-300-V voltmeter (Ferranti 2½-in. projecting-type instruments).

The wiring of the set is carried out inside the hollow panel. Emerging are three t.r.s. flexible cables: a pressure cable, terminating in a 5-A B.S.S. two-pin plug; a small-current cable, with 5-A Reyrolle plug, for the 0-1-A instruments; and a large-current cable, with 15-A Reyrolle plug, for the 0-20-A instruments. These plugs connect to the socket-outlets shown in the diagram, which explains that the 10-A meter is the master sub-standard, always being in commission, and that the 1-A sub-standard meter responds only when the load-range switch is thrown over to the low-load side.

As the set is not fixed in place the tester can dispose it conveniently; he can take it, for the occasional check-up, to the standardising bench; and he can more frequently (and whenever doubt arises) refer it to the sub-standard on a neighbouring and similarly equipped bench by plugging into the second sockets that are normally out of use. He keeps a day-to-day watch upon the two meters on the low loads to which they both respond—this being especially critical so far as the master meter is concerned. The indicating instruments usefully check that load settings are correct, and as to whether normal voltage or 110 per cent. voltage (for creepage test) obtains.

This description of Sunderland Corporation apparatus is published by permission of Mr. W. A. Royle, borough electrical engineer.

In the Courts

Liability for an Accident

In the King's Bench Division on January 27th Mr. Justice Mackinnon concluded the hearing of an action brought by Mr. F. G. Olley to recover from Johnson & Phillips, Ltd., and F. L. Smidth & Co., contractors, damages for alleged negligence as a result of which the plaintiff had had to have the second finger of his right hand amputated, while the index finger was also affected.

The plaintiff had been employed as a foreman erector by Johnson & Phillips, Ltd., for some years. In October, 1934, both defendant companies were engaged in the electrical equipment of a rotary kiln at the Purfleet works of the Tunnel Cement Co. Plaintiff said that he was employed by Johnson & Phillips on this work, or, alternatively, had been lent by them to Smidth & Co. While working on a remote-control panel his hand came into contact with a relay charged at 500 V. As a result he received severe burns and injuries.

It was his case that one or other of the defendants were the "occupiers" of the factory and as "owners" of the equipment had failed to observe the Electricity Regulations made under the Factory and Workshops Acts so that it was made safe to work upon.

Johnson & Phillips, by their defence, said that they were under contract to the other defendants to lay cables and connect up certain motors and control gear and the services of the plaintiff were lent to Smidth & Co. and he was subject to their control. They further said that the equipment was owned by Smidth & Co. and not by them, and they denied that they were the occupiers of the factory, or that they had been guilty of negligence or breach of duty. They also pleaded contributory negligence on the part of the plaintiff and stated that he had been paid compensation under the Workmen's Compensation Act, 1925, since the date on which the accident occurred.

The other defendants also denied negligence or breach of duty and maintained that they were not the owners of the equipment in question or the occupiers of the factory. They also contended that the plaintiff had been guilty of contributory negligence.

After hearing arguments by Counsel for the respective parties his Lordship, in the course of his judgment, said that at the time of the accident Smidth & Co. were the "owners" of the equipment within the meaning of the Act as ownership would not pass to the Tunnel Company until the plant had been completely erected and handed over. Although the plaintiff was not being paid by Smidth & Co. it was evident that they were paying Johnson & Phillips for the loan of his services and thus for the purposes of this case he was at the material time in Smidth & Co.'s employ and they were liable for the fulfilment of the requirements laid down by the regulations. He found, therefore, that Smidth & Co. had committed a breach of the regulations and gave judgment against them, awarding the plaintiff £250 plus £17 special damages.

As to Johnson & Phillips, he gave judgment in their favour with costs. He directed, however, that the plaintiff could recover those costs from Smidth & Co. so far as they had been incurred up to the time of "discovery" by both of the defendants at which time the plaintiff had an opportunity of inspecting the document so disclosed and could have then discontinued the action against Johnson & Phillips.

Wire Across a Highway

Frederick Wills, Edinburgh, was charged at Dundee Sheriff Court on January 29th that, being the person in charge of the work of erecting the electric lighting plant for Wellbank Village, Angus, he caused a wire to be placed across the highway in a manner likely to be dangerous to persons using the road, whereby a man was pulled from his motor cycle and injured.

Evidence for the prosecution was that the wires were hanging down over the road while linesmen were substituting superstructures on poles on either side of the road. There was nobody on the road to give a warning. Sheriff Malcolm found respondent guilty and imposed a fine of £2.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

Co-operative Society and Lamp Manufacture

Mr. J. Penny, director of the Co-operative Wholesale Society, stated at the quarterly meeting at Manchester that they had been interested in the question of manufacturing electric lamps for use in the Society's own departments and factories and for resale to the retail societies. It was evident that to make a success of the business they would have to have a big production and would have to follow mass production lines. The Scottish C.W.S. had joined hands with the Swedish C.W.S. to establish a factory at Shieldhall, and they wanted the C.W.S. to go in with them. The Wholesale directors were going thoroughly into the matter and he hoped that they might be able to report further on the matter at the next meeting of the board.

The N.A.R.R.

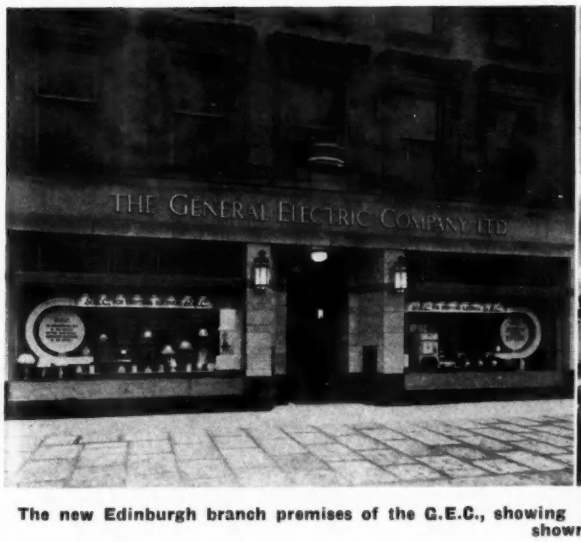
In the February *Electrical Contractor* members of the National Electrical Contractors' Trading Association are urged to support the recently formed National Association of Radio Retailers—an allied body. It is considered that the amount of support so far accorded the new Association has not been satisfactoy.

Improved Wet H.T. Batteries

Batteries are often charged in an atmosphere containing fine acid spray which settles on the sealing compound. Evaporation leaves a concentrated film of acid covering the top of the battery which provides, between the 10-V terminals, a leakage path for current, small in amount but continuous. As h.t. batteries are usually charged at infrequent intervals this loss may materially reduce their working capacity. In order to obviate such leakage "Exide" wet high-tension batteries will in future be supplied with leakage current shields in the form of a porcelain collar fitted round each terminal and separated from it by an air gap.

New G.E.C. Premises in Edinburgh

Although the General Electric Co., Ltd., has been established in Scotland since 1893, it was not until 1920 that the company opened a branch in Edinburgh to cater for the South Eastern District of Scotland. This branch has met the demand of constantly increasing business until recently it was deemed advisable to procure more extensive accommodation. Consequently the premises in George Street, now serving as the headquarters of the G.E.C. in Edinburgh, were requisitioned. This building is not only more commodious than the old Hanover Street branch, but offers facilities for extensions that may become necessary. On the ground floor the showrooms are arranged to provide ideal conditions for the display of lighting fittings, household electrical appliances and sundry other products. The displays can be viewed direct from the street frontage and windows on each side of the entrance, with the system of "Gecoray" lighting incorporated, permit a detailed examination of the nearer goods that are exhibited. Separate sections of this floor are assigned to the display of electric cookers and radio receivers, and one portion is fitted out as an all-electric demonstration kitchen. Trade customers are also catered for here and trade counters have been specially laid out with easily accessible racks and bins and there is a direct lift service to the stockrooms. These, in the main, are situated in the basement, but an emergency stockroom has been provided on the second floor. The general administrative offices of the branch are on the first floor and are of ample dimensions, well lighted and equipped on modern lines, while a general showroom is also included. Mr. W. C. Parrott is the manager of the branch. The premises were formally opened on February 1st, and, following luncheon at the North British Hotel, a tour of inspection was made.



The new Edinburgh branch premises of the G.E.C., showing (left) the exterior and (right) a view of the lighting fittings showroom

Progress in Electric Heating

Rapid progress is being made with the electrical heating plant at Earl's Court Exhibition, Messrs. Bastian & Allen, Ltd., inform us. The seven cylinders, of a total capacity of 175,000 gal., the three 4,000-kW boilers, circulating pumps, &c., are all in place, the fitting of the pipe-work, some of which is as large as 12 in., is well ahead and it will not be long before heat can be switched on. The plant can be controlled from the Fulham central sub-station, which is about 2½ miles away, and the necessary devices will be embodied in the main control panel installed there, all the indicating instruments on which are of the light beam type. Electric heating apparatus has now been installed in Glasgow's all-the-year-round indoor zoo, which has just been moved into new quarters at 68, Oswald Street. Another small but interesting job is that of heating whisky for exportation to tropical climates. Owing to the expansion of the liquid, normally filled bottles are too full on arrival abroad, and to prevent this the whisky is heated to the desired temperature as it passed into the bottles. In order that no delay shall take place it is essential that the differential of the thermostatic control shall be very small. The bottles are filled by a machine which is set for the correct amount by Excise officers. Among other recent orders received by the same company is a repeat order for a 120-kW steam boiler for a research institute, a 50-kW immersion heater type boiler for electricity offices, a 30-kW steam boiler for an ice-cream manufactory, a 450-kW plant for a large technical college and a 200-kW school installation. An increasing demand is reported by Messrs. Bastian & Allen for 10 to 20-kW low-pressure steam boilers to supply sterilising equipment on farms and dairies.

Motors for Refrigerators

The second annual exhibition of motors for refrigeration and other apparatus arranged by Delco-Remy & Hyatt, Ltd., was held last week at the company's offices in Grosvenor Road, London, S.W.1. In addition to a display of the company's motors, twelve makes of refrigerators were shown, with the motor and compressor units exposed. Condenser start motors are now generally employed, as they are capable of a very high starting torque, a ⅛-h.p. motor on test giving 500 per cent. full-load torque. A similar motor was shown submerged in tap water and running at 230 V, a.c., although of the open type. Another test indicated how the ¼-h.p. repulsion induction motor will run at up to 200 per cent. full load without overheating or repulsing. Other tests were designed to show reliability (200,000 stops and starts), silence and absence of radio interference. "Thermotron" overload protection is fitted to certain 1937 models: the automatic type comprises a bi-metal strip which will trip by current on short overload or by the general heating up of the motor on long period overloads; another form has to be reset by hand and operates on the principle of melted solder releasing a ratchet. Small motors for fans for air conditioning were exhibited, tests being

shown for aerodynamic efficiency and silence, while a second room contained a range of commercial units and motors (polyphase) up to 10 h.p. The condenser start motors (⅛ to ¼ h.p.) include resilient cradle, automatic belt tensioning by allowing the motor to lean against the pull of the belt, and flanges are available for direct coupling to rotary compressors; between ¼ and 3 h.p. repulsion induction motors are used, and three-phase for above this size. A special feature of this motor is the direct-on-mains starting, made possible by the use of a double squirrel-cage rotor. There were four washing-machine exhibits, all employing ¼ h.p. split-phase induction motors.

Birmingham Contractors' Dinner

The annual dinner of the Birmingham branch of the Electrical Contractors' Association was held on January 29th at the Imperial Hotel, Birmingham. In proposing the toast of "The Electrical Contractors' Association" Mr. F. Forrest (city electrical engineer), referred to the excellent relations which existed between the Corporation Electric Supply Department and the contractors in Birmingham, and said that the Corporation had no desire to interfere in any way with the contractors' proper and legitimate sphere and influence. Referring to the E.D.A. campaign for a million new consumers, he said that during 1936 the Birmingham Electric Supply Department connected 33,600 new supplies, as compared with 17,200 in the preceding year, and the total connections now exceeded 210,000. One result of this development was that there were almost no skilled electricians out of work in Birmingham. He was of opinion that not 10 per cent. of the installations in Birmingham were adequately wired and he suggested that architects should urge their clients adequately to wire their premises for future needs. Mr. H. M. Drake (president of the Association), in his reply said that the Association had a high standard of membership and would not admit anyone who was not fundamentally a believer in the best material and workmanship.

At the annual dinner of the Electrical Commercial Travellers held on January 29th

Sending Goods by Road

The comprehensive nature of this country's road transport system is clearly indicated in the "Goods Guide" published by *Motor Transport*. This contains classified lists of operators who carry consignments ranging from a few pounds to several tons to and from the principal towns in Great Britain. The guide is published twice yearly and this issue and the July one can be obtained for 1s. from *Motor Transport*, Dorset House, Stamford Street, London, S.E.1.

A Disclaimer

The City Electrical Co., Emerald Street, Theobalds Road, W.C.1, asks us to state that it has no connection with Messrs. K. Nicholson and F. Hyde (trading as City Electrical Co.), of Bradford, to whom reference was made under "Bankruptcy Proceedings" in our issue of January 15th.

Works Visit

On January 27th the Lewisham branch of the Electrical Association for Women visited the works of Johnson & Phillips, Ltd., at Charlton. The party was conducted round the rubber and paper cable works, including the high-voltage cable shop and research laboratories and the water heater department.

New X-ray Equipment Works

The foundation stone of the office block in connection with the new works of Newton & Wright, Ltd., manufacturers of X-ray equipment, was laid last week. The ceremony was performed by Mr. H. C. Newton, the original chairman of the company, in the presence of the staff and workpeople. Tea was afterwards served in adjacent premises, 60/68, Ballard's Lane, Finchley, which are being reconstructed and adapted to the company's requirements for the production of X-ray apparatus.

Change of Name

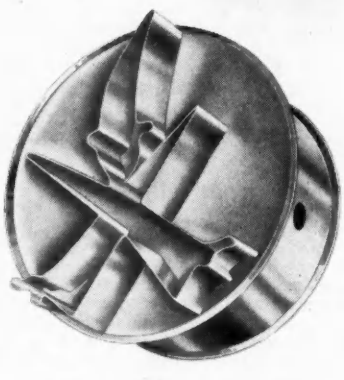
Ebonestos Insulators, Ltd., has changed its name to Ebonestos Industries, Ltd.

Electrical Commercial Travellers

The annual dinner of the Electrical Trades Commercial Travellers' Association was held on January 29th at the Connaught Rooms, W.C.2, Mr. E. North (chairman) presiding. Mr. E. L. Joseph, the president, was unable to attend owing to indisposition, and his place was taken by Mr. A. W. Beuttell, a vice-president of the Association. In proposing the toast of "The President" Mr. T. W. Heather expressed regret at the absence of Mr. Joseph, and in welcoming Mr. Beuttell referred to his long association with Mr. Joseph. He said that the list of past presidents showed that the association had the support of the leaders of the electrical industry. The members of the Association were not only travellers in the best industry, but were the best travellers of that industry. The Association was growing in power and strength from year to year. Mr. Beuttell, in responding, said that every commercial traveller should join the Association, and employers should use their influence to persuade them to join. The benefits a traveller enjoyed by becoming a member were far greater than his contributions towards it. The toast of "The Association and its Charities" was proposed by Mr. E. A. Joyce, who said that some years ago a few travellers felt that this section of the industry should have such an Association, and from a modest beginning it had grown into a healthy young body. Its quality was evidenced by its imposing list of presidents and vice-presidents. The financial position was strong and second to none as compared with the associations to which it was affiliated, and it was backed up by the best men in the industry. He referred to the suggestion that the membership was comparatively small and said that employers did not take enough interest in it; the Association ought to be at least 1,000 strong. He asked members to encourage other travellers to join, and concluded by appealing for their generous financial support. Mr. S. Johnson, in reply, mentioned the substantial donations which they had been able to contribute to the Commercial Travellers' Schools, the Electrical Industries Benevolent Institution, and other charities, and thanked the G.E.C. Dramatic Society for its contributions totalling £150 as the result of performances given by it. The toast of the visitors was proposed by Mr. R. W. Whitley, and Mr. W. E. J. Ralph responded on their behalf. Mr. Johnson proposed the health of "The Chairman and Officers," and Mr. North suitably replied in a brief speech.

E.D.A. Activities

Attention is drawn in the February Programme of the British Electrical Development Association to an "I'm Electric" pastry cutter which the Association has produced and which should prove a valuable publicity aid when pastry-making is included in a cooking demonstration. Calendar blotters illustrating the familiar "I'm Electric" figure are available, while there is still a limited quantity of "Youth and Beauty" calendars for those who require them. "I'm Electric" transfers for badges for sports clubs, &c., are also available from E.D.A. at 2, Savoy Hill, Strand, W.C.2.

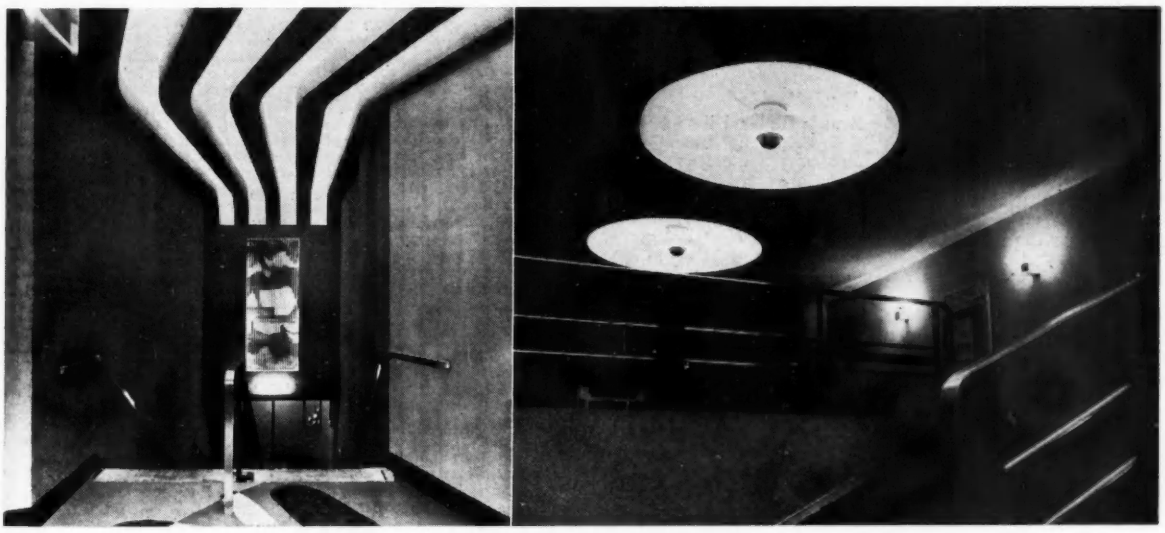


The "I'm Electric" pastry cutter

Under the auspices of the British Electrical Development Association competitions in public speaking were held in Leeds last week. Twenty candidates under thirty years of age, employed by the electricity undertakings of Yorkshire and Lincolnshire, were given audition at the electricity works, Whitehall Road, Leeds. The following were the prize-winners :—Women's Section : First prize (£5 and certificate), Miss Muriel Arguile (Halifax Electricity Department); subject, "Electricity for the Gardener." Second prize (£3 and certificate), Miss Marjorie Bolton (South East Yorkshire Light & Power Co., Ltd.); subject, "The Reliability and Safety of Electricity in the Home." Mens Section : First prize (£5 and certificate), Mr. W. S. Williscroft (Hull Electricity Dept.); subject, "Electricity for the Gardener." Second prize (£3 and certificate), Mr. A. R. Newby (Scarborough Electricity Department); subject, "Electricity and Modern Building." The judges were Ald. T. Crowe, J.P. (Wakefield), Mr. A. C. Bostel, A.M.I.E.E. (Sheffield), and Mr. G. S. Francis (London). The first prizewinners qualify for entry in the national public speaking competitions to be held in London in March.

A Cinema Installation

The Lansdowne News Cinema, Mayfair, is believed to be the only cinema in the country incorporated in a block of modern flats. The auditorium itself is actually underneath eight floors of flats. The theatre seats 286 people; all seats are of the armchair pattern and of the most comfortable and luxurious type obtainable. The auditorium is heated and ventilated by a full plenum system, with air wash and conditioning plant. Owing to the situation of the operating box, which is also underneath flats, it has been equipped with a complete ventilating plant of its own, comprising one large delivery and two extractor fans capable of giving twenty air changes per hour. The theatre equipment is particularly elaborate for a building of this type. The stage, although small, has two electrically operated curtain tracks and a three-colour float and batten. The screen is a glass-beaded screen, and, owing to the ideal projection conditions and the shape of the auditorium, this type of screen is seen to its best advantage. The operating box is equipped with two rear-shutter Simplex projectors, Stelmar arcs, spot and slide lantern and Western Electric wide-range sound system. Both machines, spot and slide lantern have adjacent control panels giving full control over auditorium lighting and curtain tracks. D.c. supply for the arcs is from a twin bulb 15-kW Hewittic mercury arc rectifier and the secondary lighting is from Hart batteries floated across a Tungar rectifier. The decoration of the theatre is by Mollo & Egan and the electric lighting fittings by Troughton & Young. The whole of the installation and equipment has been supervised by County Cinemas.



The Lansdowne News Cinema showing (left) the entrance staircase and (right) the foyer

Calendar

Messrs. Flather & Co. have issued a Coronation calendar with daily tear-off slips, surmounted by a portrait of H.M. the King, with illustrations of the company's motors and dynamos.

Catalogues Wanted

Edward Rowberry & Co., Ltd., of Broad Street, Ross-on-Wye, ask for catalogues, prices and discounts of Coronation displays.

Fixing

A useful handbook has been sent us by Rawlplug, Ltd. It bears the title "Modern Fixing Practice" and in about 200 well-illustrated pages it deals with methods of mounting all kinds of equipment on walls, floors and ceilings. Chapters are devoted to various trades, *e.g.*, plumbing, heating and ventilating, and sign making, and one of particular interest is that by Mr. T. C. Gilbert on "Fixings of Interest to Electricians." The various kinds of "Rawlplugs" and special tools are described. The book is priced at 3s. 6d., but the company states that it will send a free copy to any reader who applies for one on his business notepaper or sends his business card.

Orders Recently Booked

What is believed to be the largest electric trawl winch in existence has recently been made by Laurence, Scott & Electromotors, Ltd., for installation on the French motor trawler *Minerva*, built by Chantiers de Normandie. The winch is 23 ft. 8 in. outside the bollards and has a fore and aft length of 12 ft. 5 in. It develops 97 b.h.p. at normal full load and exerts a pull of 7 tons at 156 f.p.m. Control is by the Ward-Leonard system. A special feature is a master controller situated in the deck house, where it is accessible in even the worst weather. This controller enables various limitations to be put, from the deck house, on the operation of the winch by the control levers situated on the winch itself. Thus, movement can be confined between full forward and stop, or full reverse and stop, and in other ways. In this manner any risk of damage to the winch by careless handling can be avoided. L.S.E. winches have been supplied previously for similar craft, which travel long distances between Newfoundland and Greenland, trawling principally for cod.

The F.B.I. Business Forecast

The "Business Forecast" published in the F.B.I. "Business Barometer" for the first quarter of 1937 states that the recovery in home trade seems to be approaching a peak. Whether, however, the point of maximum activity will be reached this year or next year, it is too early to judge. Rearmament policy, the Coronation and the volume of public and semi-public work set in train during the coming year will be the determining factors. The prospects of export trade on the other hand are brighter than they have been for some time. The continuing rise in prices of important primary commodities should increase the purchasing power of many overseas countries and provide them with the much-needed funds for liquidating past debts and relaxing exchange restrictions. Coal, textiles and shipbuilding in particular should benefit, but certain other industries, especially those in the non-ferrous metal and constructional categories, may find it less easy to participate owing to the heavy pressure of orders on home account.

Social Events

Despite the cold weather there was a good attendance at the annual dance of the London School of Domestic Electric Science Old Students' Association, held last week at the Prince's Restaurant. After the interval for refreshments a cabaret was given by the students and the dancing continued until 2 a.m.

The annual staff ball of the North Metropolitan Electric Power Supply Co. is a function which gains in popularity each year, and the large gathering at the Portman Rooms, Baker Street, W., on Tuesday last was well in excess of preceding years. The event was held under the auspices of the Northmet Sports Association, with Mr. P. A. Thorogood as indefatigable as ever in his efforts to make the evening a success. In addition to the cabaret, which is a popular feature of these functions, an original note was struck by a staff talent contest, including singing, dancing and instrumental acts, which resulted in some very creditable performances. Dancing continued until the early hours to the music of Stan Atkins Band.

The third annual hot-pot supper and smoking concert of the Estimating and Contract Departments of Lancashire Dynamo & Crypto, Ltd., was held on January 23, in the Sports Ground

Pavilion. Over sixty departmental staff and friends enjoyed a pleasant evening, the chief feature of which was a four-act sketch entitled "Corcooled Cavalcade," depicting the humorous aspect of daily events in the Head Office and branch offices.

On January 29th Santon, Ltd., held an invitation dinner and dance at Newport which was attended by a large company of friends from North Lancashire, Yorkshire, London, Sussex, Hampshire, Devon, Cornwall, and Wales. After dinner and brief speeches the remainder of the evening was devoted to dancing. A number of the guests inspected the works on the following day.

Prices of Materials

Henry Gardner & Co. report, February 3rd: No change in the price of copper bars (best selected), sheet and rod and English pig lead. Spelter, £21 2s. 6d., 15s. decrease. English block tin, £227 5s., £1 increase.

Frederick Smith & Co. report, February 3rd: Electrolytic copper bars, £58 10s., £1 10s. increase. Ditto, ditto, wire rods, £65 10s., £1 10s. increase. Ditto, ditto, h.c. wire, 9⅜d., ⅛d. increase. Silicium bronze wire, 10d., $\frac{1}{16}$d. increase.

Edward Till & Co. report, February 3rd: No change in the price of India rubber, Para fine.

Trade Announcements

Mr. R. Millett, of 16, John Dalton Street, Manchester, has terminated his agency for Jackson electric cooking equipment in the Manchester district, and inquiries should now be addressed to the Jackson Electric Stove Co., Ltd., 143, Sloane Street, S.W.1.

The Manchester branch of Johnson & Phillips, Ltd., has been removed to Norfolk House, Norfolk Street, Manchester.

This month Systematic Advertising Specialists, Ltd., of Imperial House, Regent Street, W.1, celebrate their jubilee, having started in 1912 with international publicity as the main objective.

Frederick W. Evans, Ltd., Plastic Works, Long Acre, Birmingham, are at present engaged in removing into their new works, which adjoin their old premises. The address remains the same.

The "Blue Book"

The 1937 edition of "The Electrical Trades Directory and Handbook" (the "Blue Book") published by Benn Bros., Ltd., at 25s. net, differs little from previous editions. Its various sections contain the names and addresses, telephone numbers and telegraphic addresses of all important organisations, companies and persons engaged in the generation of electricity or the production and marketing of electrical goods. The various sections have been revised and brought up to date and reference is facilitated by thumb-tabbed index cards.

Dutch Electrical Imports and Exports

From the official Dutch trade returns for the past year we have compiled the appended tables showing the imports into and exports from Holland of electrical machinery and allied material during 1936 as compared with the preceding year, from which it will be seen both branches experienced a decline, the imports having fallen off to the extent of £267,486, while the exports decreased by £264,945. For purposes of comparison, the gross value of the imports and exports in sterling, at 8.95 guilders to the £, has been added.

	IMPORTS.		EXPORTS.	
	1935.	1936.	1935.	1936.
	1,000 Guilders.	1,000 Guilders.	1,000 Guilders.	1,000 Guilders.
Electric generators and parts...	1,096	667	163	148
Electric motors weighing under 11 lbs.	67	66	11	14
Electric motors weighing over 11 lbs.	669	822	638	637
Parts of motors	258	284	99	50
Radio apparatus and parts ...	8,697	7,918	38,326	34,437
Telegraph and telephone apparatus and parts	3,957	3,432	212	283
Electric vacuum cleaners ...	732	803	209	116
Incandescent lamps	498	483	5,874	5,586
Other electric lamps	20	28	244	379
Insulated wire and cables ...	2,541	2,425	1,134	1,575
Bulbs for electric lamps ...	93	90	998	1,293
Electric locos and vehicles ...	92	68	—	6
Electric cycle lamps	737	921	16	70
Dynamos and parts for ditto...	392	81	20	15
Electric refrigerators	203	317	14	6
Elec. instruments and other goods...	6,679	5,932	2,414	3,386
Totals. Guilders	26,731,000	24,337,000	50,372,000	48,001,000
Totals at 8.95 guilders to £...	£2,986,704	£2,719,218	£5,628,146	£5,363,201

New Catalogues and Lists

Curtis Lighting Co. of Great Britain, Ltd., Aldwych House, Aldwych, London, W.C.2.—A leaflet describing an X-ray diffuser.

Holophane, Ltd., Elverton Street, Vincent Square, London, S.W.1.—A catalogue section describing general service floodlight projectors.

Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester, 17.—An illustrated art booklet containing technical articles dealing with flameproof electrical mining equipment.

Franco-British Electrical Co., Ltd., 25/27, Oxford Street, London, W.1.—A catalogue of Coronation lighting equipment.

Kryn & Lahy (1928), Ltd., Coburn Works, Letchworth.—A catalogue of petrol engines.

Griffin & Tatlock, Ltd., Kemble Street, London, W.C.2.—A sale list of physical apparatus.

Davis Bros., Ltd., 22, Buckingham Street, London, W.C.2.—A folder dealing with floodlighting.

Donald MacPherson & Co., Ltd., 21, Albion Street, Manchester, 1.—A booklet on "Foochow" paint processing.

L. G. Hawkins & Co., Ltd., 30/35, Drury Lane, London, W.C.2.—A complete 75-page art catalogue, illustrated in colour, dealing with domestic electrical appliances, and a supplementary catalogue of lighting fittings.

Bankruptcy Proceedings

A. King, 6, Beresford Square, Woolwich, London, S.E.18, wireless and electrical dealer.—This debtor's public examination took place at the Court House, Burney Street, Greenwich, recently. It was reported that he commenced trading as a wireless dealer in 1929 under the style of the Beresford Wireless Co. Later debtor opened a number of branches, including one at East India Dock Road, Poplar, and another at Powis Street, Woolwich. The latter business was not successful, and after a few months that branch was closed. In March, 1932, a fourth shop was opened at Reading, but it was closed after six months, having been unsuccessful. Early in 1933 debtor started trading at Military Road, Chatham, and in November, 1933, also opened a shop at Villiers Street, Strand. The latter business lasted for about twelve months. Debtor stated that in January 1935, a limited company was formed, to which he transferred his three remaining businesses at Woolwich, Poplar and Chatham for £1,232. Of that amount £1,000 was satisfied by the allotment of shares, and the balance was met by the company paying the liabilities of the individual businesses. Debtor said his shares were in the name of a nominee. He himself was general manager of the company, and his salary was £20 a week. On May 25th, 1936, the company went into compulsory liquidation with liabilities of £3,136. Debtor agreed that one of the causes of the failure of the company was that he had drawn too much salary. The examination was adjourned for closing.

W. H. Hammond, 18, Church Street, Leamington Spa, trading as W. H. Hammond, radio and electrical engineer.—This debtor filed his own petition and he has lodged a statement of affairs showing gross liabilities of £1,066, of which £847 is expected to rank for dividend, with net assets of £207, or a deficiency of £641. The debtor states that he first became aware of his position in 1930, this being brought about by the fall in prices of stock held by him. He further states that since that date he has gradually reduced his liabilities. He attributes his failure to heavy overhead expenses and fall in prices of stock while running a branch shop at Leamington.

A. P. Steer, wireless dealer, 73a, Fore Street, Bovey Tracey.—Last day for receiving proofs for dividend February 6th. Trustee, Mr. W. R. Cocks, Exeter Bank Chambers, Broadgate, Exeter, Official Receiver.

P. D. Watkins, radio engineer, 43, High Street, Criccieth.—Receiving order made January 25th on debtor's own petition.

A. E. Cowee, radio and electrical engineer, 113, Mount Pleasant Road, Tottenham, N.17.—First meeting February 9th at 29, Russell Square, W.C. Public examination February 17th at the Court House, Upper Edmonton, N.

R. C. Marshall (Northern Service Depôt), radio dealer, 318, Stretford Road, Manchester.—First meeting February 5th at 20, Byrom Street, Manchester. Public examination February 12th at the Court House, Manchester.

C. W. Prosser (Prosser Bros.), electrical engineer, 81, Woodside Street, Cinderford.—Trustee, Mr. H. Wheeler, 26, Baldwin Street, Bristol, Official Receiver, released January 19th.

A. W. Harber, electrician, 1, Kathleen Place, Redditch.—Last day for receiving proofs for dividend February 13th. Trustee, Mr. R. K. Clark, 159, Great Charles Street, Birmingham, Official Receiver.

C. G. Crowther, radio electrician, 92a, King Cross Street, Halifax.—Last day for receiving proofs for dividend February 15th. Trustee, Mr. W. F. Cresswell, 71, Manningham Lane, Bradford, Official Receiver.

C. Thornton, wireless dealer, Main Street, Ffynnongroew.—Receiving order made January 22nd on debtor's own petition. First meeting February 5th at the Official Receiver's office, St. Peter's Churchyard, The Cross, Chester.—Public examination February 16th at the Castle, Chester.

R. H. Bullough, radio, electrical and cycle dealer, 72, Gregory Boulevard, Nottingham.—Receiving order made January 22nd on debtor's own petition.

W. E. Watson and **C. A. Childs** (Watson & Childs), wireless and electrical engineers, 7, City Road and 5a, Southgate Street, Winchester, and at Salisbury, Fareham, Wickham and Andover.—Public examination February 17th at the Court House, Southampton.

C. V. Adnitt, radio dealer, 11, Alfred Street, Rugby.—Last day for receiving proof for dividend February 10th. Trustee, Mr. C. J. Band, 9-11, High Street, Coventry.

H. Cooke (Western Wireless), wireless and electrical engineer, 33, Fisherton Street, Salisbury.—First and final dividend of 18s. 2d. in the £, payable January 30th at 12, Rolleston Street, Salisbury.

Company Liquidations

K. Raymond, Ltd., wireless dealers, 28a, Lisle Street, London, W.C.2, and branches.—The statutory meeting of creditors of the above was held on January 28th at the offices of Messrs. Lucas, Warley & Lucas, Brettenham House, Waterloo Bridge, Strand, W.C. The statement of affairs showed ranking liabilities of £5,331, of which £5,088 was due to the trade and £243 to sundry creditors. The net assets were £409, leaving a deficiency, so far as the creditors were concerned, of £4,921. The creditors decided to confirm the voluntary liquidation with the liquidator nominated by the company. A committee was also appointed consisting of Mr. C. Latham and the representatives of E. K. Cole, Ltd., and Hendersons Wholesale Electric & Radio, Ltd.

Electricity Supply

Lighting, Domestic, Power

Amble (Northumberland).—BULK SUPPLY AGREEMENT.—The Urban District Council has entered into a fresh agreement with the North-Eastern Electric Supply Co., Ltd., for the supply of electricity in bulk. It is expected that, in consequence, there will be reductions in charges to consumers.

Barking.—LOANS FOR EQUIPMENT.—Sanction has been obtained by the Electricity Committee to borrow sums totalling £35,526 for mains and services, buildings and plant.

Blackburn.—DOMESTIC ELECTRICAL APPARATUS.—A proposal of the Electricity Committee to introduce a scheme by which householders will be able to obtain electric cookers and appliances on hire has been approved by the Finance Committee. For the purchase of heavy-duty domestic appliances permission is being sought to borrow £20,000.

Brighton.—PUMPING SEA-WATER TO POWER STATION.—It is proposed to install pumping plant to ensure a constant supply of sea-water to the generating station, and in future the hot water leaving the cooling plant will be discharged by pipe line into the sea.

LAND FOR POWER STATION EXTENSION.—For the eventual extension of its Southwick power station the Corporation desires to acquire the freehold of adjacent land, and the matter was before the Official Arbitrator recently. After a hearing lasting several hours the proceedings were adjourned until March, when they will be continued in London.

Canada.—HYDRO-ELECTRIC PROJECT.—It is announced by the Hydro-electric Power Commission of Ontario that a start is shortly to be made on the development of the Ragged Rapids power site on the Musquash River. The cost is estimated at $1,000,000 and the new station will have an installed capacity of 10,000 h.p. Other sites on the river may be developed to give an eventual total installed capacity of 40,000 h.p. It is interesting to note that in recent years the peak load on the Georgian Bay system has reached its maximum in August, due to summer cottage residents. This year the peak rose to 29,839 h.p. in August. The new plant will help relieve the Niagara system, which is tied in with the Georgian Bay system.

Cheltenham.—MAINS.—For the purpose of laying cables to supply houses on the Whaddon estate now being developed, the Electricity Committee is seeking sanction to a loan of £1,966. The Committee has also adopted a scheme for an overhead supply to Gotherington at an estimated cost of £1,337.

Croydon.—LOAN.—The Corporation is to borrow £159,256 to meet expenditure on the generating station and the distribution system during the ensuing financial year.

Darlington.—POWER STATION EXTENSION.—The Town Council is to be recommended by the Gas and Electricity Committee to approve a £300,000 plan for extending the generating station. The work will include the installation of a turbo-alternator set with a maximum continuous rating of 20,000 kW complete with ancillary plant, two boiler units each with a maximum continuous evaporative capacity of 120,000 lb. per hr., and ancillary plant with buildings and civil engineering works, and a cooling tower of 1,000,000 gal. per hr.

Darwen.—CHANGE-OVER.—The Electricity Committee is applying for sanction to borrow £13,000 to meet the cost of changing from d.c. to a.c. in three additional districts.

Durham.—ELECTRICITY FOR SCHOOLS.—The Board of Education has approved schemes submitted by the County Education Committee for the installation of electric light at the Beamish, Peases' West and Tanfield Burnopfield schools.

Finchley.—EXTENSIONS.—Sanction has been obtained by the Electricity Committee to borrow £22,762 for extensions.

Guildford.—MAINS.—The Electricity Committee is to extend mains at a cost of £1,822.

STAND-BY SUPPLY.—Pending the completion of the scheme for the extension of the generating station it is proposed that application shall be made to the London and Home Counties Joint Electricity Authority for a supplementary supply of electricity as may from time to time be necessary to provide a sufficient stand-by.

Hawarden.—CHEAPER LIGHTING.—The Rural District Council has reduced the lighting rate from 7d. to 6d. per kWh.

Horsham.—PROGRESS OF UNDERTAKING.—Mr. F. Ffrench, electrical engineer to the Urban District Council, reports that during the year ended March 31st last the Electricity Department sold 3.6 million kWh, an increase of almost 33 per cent. in comparison with the previous year. The rural scheme contributed materially to the expansion. Of the 444 new consumers 180 were on the rural system. The winter load reached 1,717 kW, the demand on the Central Electricity Board being limited to 600 kW. Considerable extensions to mains, underground and overhead, were carried out during the year, the total length of these at March 31st being more than 100 miles and serving 4,432 consumers. There was steady development in the domestic load, and in that direction still further expansion is looked for. While gross revenue increased by 16.3 per cent., production and distribution costs rose only 5 per cent.

Irish Free State.—PROGRESS DURING 1936.—The quantity of electricity sold during 1936 amounted to 207,300,000 kWh, an increase over the previous year of 35,800,000 kWh, according to a statement issued by the Electricity Supply Board. It is recalled that the figures for 1935 were depressed, by reason of the tramway strike, to the extent of approximately 5,000,000 kWh. The total number of consumers at the end of 1936 was 127,306, an increase of 13,225. The industrial power load connected to the national network was 78,605 h.p. at the end of 1936, an increase of 9,407 h.p. The lighting and power supply at the Curragh Military Camp is passing into the hands of the Board. Hitherto it was provided by a private installation. It will be some time, however, before the change-over is completed.

Night photograph of the new Morris Engine Works at Coventry. In this section there are over 600 500-W dispersive reflectors supplied by Rowland's Electrical Accessories, Ltd.

Liverpool.—AIRPORT LIGHTING.—Application is being made by the Finance Committee for sanction to borrow £2,115 in connection with the provision of lighting equipment at the airport.

London.—BERMONDSEY.—The Electricity Committee is to erect and equip a sub-station in Elephant Lane at a cost of £10,335.

Sanction is being sought by the Electricity Committee to

Important Australian Scheme

A *Reuter* report from Sydney states that the New South Wales Government has taken preliminary steps towards the launching of a big electrical development scheme in the State. The undertaking, which will be the largest of its kind in Australia, is estimated to cost £12,000,000, and will take nine or ten years to complete. The Electricity Advisory Committee will be asked to complete its proposals for rationalising power generation and distribution, in conjunction with a scheme of railway electrification, and the possibilities of hydro-electric development are to be considered. The scheme aims at the electrification of the State railways from Sydney to Newcastle in the north, to Nowra on the south coast, to Lithgow on the main western line, and to Goulburn on the main southern line. It also embraces the provision of electricity in country centres; the construction of a power line along the north coast to link Newcastle with the existing Nymboida system; development of water power on the Snowy and Shoalhaven Rivers, with a transmission line to Goulburn and linking with the existing Burrinjuck system for supplying the southern part of the State; and the construction of high-voltage lines along some of the main railways as the basis of a distribution network. A feature of the scheme will be that all power houses will be linked. The Premier, Mr. Stevens, who studied electricity schemes while abroad last year, states that the results of the scheme will be to reduce the cost to consumers and industries in the great centres and to modernise the railways in a way that will mean reduced freights and faster travel.

a loan of £40,000 for extensions and £14,255 for sub-stations.

HAMMERSMITH.—At a cost of £254 the Electricity Committee is to provide a further supply to the premises of W. James & Co., Ltd.

STOKE NEWINGTON.—The Council has received permission to borrow £1,640 for the provision of electric in place of gas lighting in Albion Road and Church Street.

Manchester.—SERVICE MAINS.—The Electricity Committee is seeking sanction to borrow £100,000 for service mains.

Morecambe.—FOOTBALL BY FLOODLIGHT.—An overhead cable is to be erected to enable Morecambe Football Club, Ltd., to utilise electricity for floodlighting purposes in connection with the team's training.

LOAN.—Sanction to a loan of £10,000 for extensions has been obtained by the Electricity Committee.

SUB-STATION EQUIPMENT.—Additional plant is to be provided at the Victoria Street sub-station at a cost of £1,400.

Mountain Ash.—CHARGES FOR MARCH QUARTER.—The general manager of the electricity undertaking, Mr. E. W. Jones, informs us that the lighting flat rate for the quarter ending March 31st next is to be 1½d. per kWh, with a prompt payment discount of ½d. per kWh, making a net flat rate of 1d. per kWh. This is the seventh successive quarter in which charges have been varied from the standard rate of 2½d. per kWh. It is estimated that the revenue for the financial year 1936-1937 will produce little if any surplus.

Nelson.—ELECTRICALLY DRIVEN MILLS.—The Lomeshaye Mills, Nelson, which have been acquired by the Union Rubber Co., are to be driven by electricity.

New Romney.—TENANTS ASK FOR ELECTRICITY.—Tenants of Council houses wish to have the existing gas lighting replaced by electricity. The Council has no objection to the installation of electricity, but does not intend to bear the cost of outside wiring.

Northern Ireland.—POWER STATION EXTENSION INQUIRY.—An inquiry was conducted in Belfast recently by Mr. A. N. East, engineering inspector of the Electricity Commission, London, into the application of the Larne (Northern Ireland) Electric Light & Power Company, Ltd., for the consent of the Ministry of Commerce to the extension of the generating station at Larne Harbour to provide additional supplies to the Antrim Electricity Distribution Co. Mr. MacDermott, for the applicants, said that they and the Antrim Co. expected an increasing demand for supplies, and it was essential that the plant should be extended at an approximate cost of £14,500. Mr. G. Saunders, engineer and manager of the Larne Electric Light & Power Co., Ltd., said there were still cooking developments to take place in Larne and these would add a great deal to the load. So far as his company was concerned there was never any proposal to link the Larne station with the Belfast Station. Mr. Gauvain, managing director, Antrim Co., said there had been big developments during the past three years. Their estimates were based on a progressive increase of 20 per cent. in the next five years and 10 per cent. in the following years. Mr. James Craig, solicitor, on behalf of the Belfast Corporation, said it would be inconvenient for the Corporation at the present time to provide a stand-by supply to the Antrim Electricity Distribution Co. Mr. Whysall, Belfast city electrical engineer, said he was willing to recommend the Corporation to do everything possible for the benefit of electrical development in Northern Ireland. He strongly objected to running parallel with the Larne undertaking until full consideration had been given to all technical details and proper equipment installed. Mr. Thomas Christie, chief engineer to the Electricity Board for Northern Ireland, said that at the moment he saw no alternative to the proposal that was before the inspector. There was no opposition to the application, and the inquiry closed.

Sheffield.—MAINS.—The Electricity Committee is to extend mains at a cost of £7,302.

LOANS.—Permission has been obtained to negotiate loans aggregating nearly £300,000 for generating and steam raising plant, transformers and switchgear, and mains at the Parsons Cross estate, &c.

South Africa.—JOHANNESBURG.—In the year ended June 30th last the number of consumers taking supplies from the Electricity Department increased by 3,274 to 44,171, while the quantity of electricity sent out to the distribution network rose from 169.4 to 202.8 million kWh, representing an expansion of 20 per cent.

Southport.—NEW FEEDER.—A new high-voltage feeder is to be provided from Eastbank Street to Ainsdale, at an estimated cost of £6,000.

Stoke-on-Trent.—LOAN SANCTIONS.—The Electricity Commissioners have sanctioned the borrowing of £150,000 for general mains and services, £6,612 for the James Street (Stoke) sub-station building and equipment, £4,350 for the Bankhouse Road (Hanford) sub-station building and equipment, £4,100 for mains and sub-station equipment at Wesley Street (Fenton), and £4,200 for mains, &c., in Nile Street district (Burslem).

STREET LIGHTING.—Electric street lighting is to be provided at Crossway Road and Leek New Road (Sneyd Green), Buxton Street (Sneyd Green), Blurton Road (Blurton), Uttoxeter Road (Longton), Cornhill (No. 2) housing site, Hollywall Lane (Goldenhill), and Townsend (Bucknall).

SUB-STATIONS.—Application is to be made to the Electricity Commissioners for sanction to borrow £3,392 for Sutherland Road (Longton) sub-station and equipment, £2,908 for Gate Street (Longton) sub-station and equipment, and £7,600 for high-voltage and low-voltage mains in connection with these two sub-stations. Owing to the growth of the load in the Kingsway sub-station area additional transformer capacity is to be provided at a cost of £1,950.

HIGH-VOLTAGE MAINS.—Application is to be made to the Electricity Commissioners for sanction to borrow £50,000, being the Corporation's share of the estimated cost of proposed 33,000-V trunk mains, with the necessary switch-houses, switchgear and connections.

Stone.—BULK SUPPLY CHARGE REDUCED.—The Stoke-on-Trent City Council recently gave further consideration to the request from the Urban District Council for a reduction in the terms of the existing bulk supply agreement, and decided that, while the kW charge under the agreement should remain as at present, the charge per kWh should be reduced to 0.4d. This concession will be granted subject to the Stone Council agreeing not to oppose certain proposals of the City Council with reference to a possible extension of supply in the near future.

Sunderland.—ILLUMINATIONS.—The Parks Committee has agreed to a scheme for the construction of an illuminated waterfall on the south side of the Ravine at an estimated cost of £450 as a permanent feature. Other points approved by the Committee are the laying out in bedding plants of a floral crown and a floral clock. The clock will be operated electrically.

Tynemouth.—BULK SUPPLY.—No objection is being offered by the Central Electricity Board to the proposed agreement to be entered into between the Town Council and the North-Eastern Electric Supply Co., Ltd., for a bulk supply of electricity.

United States.—FUNDS FOR FEDERAL POWER PROJECTS.—Congress has been asked to appropriate $43 million for the operations of the Tennessee Valley Authority during the next fiscal year, states *Electrical World*. In addition, the T.V.A. can contract for works costing a further $5,500,000, to be paid out of future appropriations. Faced with a number of legal actions against expansion of its power activities in competition with private utilities the Authority is hurrying the completion of its numerous dams to provide evidence of the extent to which the Government has entered into the power production business. So far, $150 million has been spent on the construction of six dams (Norris, Wheeler, Pickwick Landing, Guntersville, Chickamauga and Hiwassee), transmission lines, &c.

Uxbridge.—ELECTRICITY FOR COUNCIL HOUSES.—A proposal to install electricity in 856 of its houses at an estimated cost of £10,400 has been approved by the Urban District Council.

Wallasey.—LIGHTING THE PROMENADE.—Sanction has been obtained by the Electricity Committee to a loan of £2,000 for mains in connection with the Promenade lighting scheme.

West Bromwich.—SUB-STATION.—The Electricity Committee is seeking sanction to borrow £5,000 for sub-station equipment.

York.—EXTENSIONS.—Sanction to loans of £17,458 for mains and sub-stations, £1,721 for extensions at Huttons Ambo and £1,210 for extensions at Harton and Barton-le-Willows, has been obtained by the Electricity Committee.

Traction

Algeria.—NEW TRAMCARS.—The Algiers tramway authority is taking delivery of twenty-five double-bogie trams with articulated bodies 64 ft. long. They each have nine first-class and thirty-three second-class seats and fifty-eight normal standing places, but the crush capacity is estimated at 150 persons. The tare weight is 21½ tons and the four 600-V d.c. motors have an aggregate output of 180 h.p.

Australia.—WELDING RAILS.—It is reported in the *Railway Gazette* that an automatic flash butt rail-welding machine placed in service at the Spotswood permanent-way depôt has quickly proved its worth. Welding is so greatly speeded up by the automatic welder—which, according to tests at Melbourne University, gives results practically equal to the full strength of the rail—that, in the period October 6th to November 14th (excluding Saturday afternoons and Sundays), two shifts, each of 44 hr. a week, completed 2,538 welds with 90-lb. rails welded into 225-ft. lengths for the Newport-Geelong relaying.

France.—ELECTRIFYING THE PARIS-BORDEAUX LINE.—A *Reuter's Trade Service* message states that the Paris-Le Mans electrification is expected to be completed by the end of next summer and the Tours-Bordeaux section, which will render possible an uninterrupted service of electric trains between Paris and Irun, by the summer of 1938. The work of electrifying the Tours-Bordeaux line is being carried out in four stages, *viz.*, Tours-Chasseneuil, Chasseneuil-St. Amant de Boixe, St. Amant de Boixe-Les Eglisottes and Les Eglisottes-Bordeaux. The work involves important changes in the permanent way and a good deal of new construction, including fourteen sub-stations. The supply will be taken from the Marèges hydro-electric power station, the Pyrenées stations, and stations in the Paris area. Distribution lines at 90,000 V will run from Marèges to Poitiers *via* Eguzon, from Tours to Bordeaux-Pessac, and from Angoulème to Cholet. There will be a

150,000-V line from the stations in the Pyrenées to Bordeaux-Pessac. The system will thus be fed from both ends of the line.

Sweden.—FURTHER RAILWAY ELECTRIFICATION.—The Budget estimates include Kr. 12,000,000 for the continued electrification of State Railway lines, states *Reuter's Trade Service* from

Improved street lighting at Harrow Road, Wembley, by means of 127 250-W "Mazda Mercra" lamps in "Dilen" lanterns. Since this photograph was taken the North Metropolitan Electric Supply Co. has placed a further order for 173 complete units for use in Fryent Road, Bridgewater Road, Park Lane, Salmon Street, and Harrow Road (continuation)

Stockholm. Detailed proposals in this respect will be presented by the Government later on, but it is already announced that the programme concerns the Aange-Braecke-Laangsele main line and the junction lines, Braecke-Oestersund and Göteborg-Uddevalla. The Aange-Laangsele line, which is 162 km. long, is a direct continuation of the Stockholm-Aange line, electrification of which was started some years ago. The two other lines are 71 and 89 km. long, respectively. The total cost of the electrification of these lines is estimated at Kr. 21,000,000. Plans for the electrification of the Göteborg-Amal line are now ready. The estimated cost is Kr. 13½ million. Electric operation of the railway line from Laxa to Kristinehamn was commenced on January 18th. Electrification works are now being extended to the second section, namely, from Kristinehamn to Charlottenberg.

Tyneside.—RAILWAY ELECTRIFICATION.—Neither the rolling stock nor the sub-station work in connection with the L.N.E.R. electrification from Newcastle to South Shields has proceeded as fast as anticipated, and there are now doubts as to whether an electric service will be possible in time for the summer traffic.

United States.—NEW YORK TRANSPORT IMPROVEMENT.—Proposals are being examined for the prolongation of the fast electric suburban trains of the New York, Westchester and Boston Railway into down-town New York by a connection with the Interborough Rapid Transit line. If the proposal is adopted new streamlined electric trains will be built to maintain the service. The Brooklyn-Manhattan Transit line has placed a $4,000,000 contract for the extension of its Williamsburg power station and is proposing to make an extension to its subway.

Communications

Great Britain.—RADIO INTERFERENCE.—In the House of Commons on Monday Mr. Storey asked the Postmaster-General whether he had come to any decision on the recommendations of the committee appointed by the Institution of Electrical Engineers that statutory powers should be sought to compel owners of electrical plant which caused interference with broadcast reception to install suppression apparatus. Major Tryon said that the question of introducing a Bill to secure the powers required to give effect to the committee's recommendations was under consideration, but he was not yet in a position to announce a decision.

India.—BROADCASTING NEEDS.—Some of the views that M. Maarschalk, overseas director of the Philips concern of Holland, holds on the needs of broadcasting in India and the future trade find expression in an article written by a contributor in the Annual Industries Supplement of *Capital*. According to the Dutch expert, India's greatest need at the moment is for specialists. For some time to come development must be financed by the Government. A fixed policy for the future is essential if manufacturers and traders, as well as listeners, are to co-operate with the Government. It is the view of M. Maarschalk that the installation of a few high-power transmitters in India would defeat the whole purpose, as broadcasting must appeal differently to each class and each creed in a variety of languages and a variety of forms. Radio manufacturers in India are meeting difficulties, the most important of which is the lack of technically equipped radio mechanics. To sell a receiving set without service is hardly good business, and the main part of the activities of the radio manufacturers during the last six years has been to train such mechanics and thereby establish a market for their wares. Schools to teach radio technique are urgently needed. The manufacturer also meets with difficulty in finding an importing firm able to represent it. A number of so-called "agents" are ruining the trade by price-cutting. In M. Maarschalk's opinion only about 75 per cent. of the importers are capable of handling the business. The belief that broadcasting in India can only develop with the introduction of a cheap receiving set does not find favour with M. Maarschalk. It is popularly held that the price of the cheap set should be within the region of Rs.100, but it is not likely to be less than Rs. 200, and for the production of a really serviceable set at this price the sales would have to be considerable. The other alternative, namely, the manufacture of sets in India, is out of the question at the present moment as the necessary skill is lacking.

Orkney.—TELEPHONE SERVICE.—Further experiments are to be made with ultra-short wave radio-telephony between the Orkney and Shetland Islands and the mainland. The aim is to provide a trunk telephone service. This was announced at a meeting of the Aberdeen Chamber of Commerce.

Sweden.—RAILWAY SIGNALLING BY RADIO.—The Swedish firm Aga-Baltic, of Stockholm, is reported to have developed a new system of radio signalling for railway shunting purposes which is being tried out at Malmö, South Sweden. A short-wave transmitter is modulated by a number of different audio frequencies, each corresponding to a "command impulse," operating a loudspeaker and flashlamp signals actuated by a receiver installed in the engine in front of the driver's seat. The transmitter is installed in a kiosk and can be operated either locally or from a control box, the overhead high-voltage lines being used as an aerial system. By pressing a button in the control box the official in charge of shunting operations can direct the engine driver by means of combined loudspeaker notes and flashlamps lighting up behind small panes on which the orders are printed. The loudspeaker note serves to draw the attention of the driver to a change of signals. A given signal stays on until another button is pressed, when the first lamp is extinguished and a new one lights up. If special directions not included in the range of standard signals are to be given the shunting superintendent can use a microphone to give verbal instructions to the driver. The control box contains five push-buttons operating four standard signals and one warning the driver to listen to verbal instructions through the loudspeaker. On electric traction systems very little interference occurs apart from arcing at the bow collectors which is sometimes rather severe.

A Swedish railway official using the radio signalling apparatus at Malmö

Ray-operated Traffic Signals

The first application of ray-operated pedestrian signals for use at a road junction in this country was inaugurated by the Mayor of East Ham on Friday last week. It is not, however, the first time that ray-operated signals have been put into service, a system having been inaugurated at a simple pedestrian crossing in St. Helier Avenue, Morden, by Mr. Hore-Belisha in April last. The East Ham road junction (Romford Road and Fourth Avenue), is now controlled by a standard "Electromatic" (Automatic Telephone & Electric Co., Ltd.), system of road signals, using pressure-operated vehicle detectors and overhead tramway contactors for the detection of tramcars. There is a busy pedestrian crossing on the east side of the junction, and a photo-electric ray for the automatic detection of pedestrians has been provided on each side of the carriageway to bridge the gap in the guard rails, through which pedestrians must pass before crossing the road. Special signal faces for the guidance of pedestrians, worded "Cross Now" are illuminated during the time that all traffic is stopped. The interruption of the rays brings in a safe crossing period for the pedestrian, in the same manner as right-of-way is given to road traffic when vehicles pass over the now familiar road vehicle detectors.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Amble.—March 8th. U.D.C. Electricity Department. Transformers and other apparatus for the Morwick water pumping scheme. (See this issue.)

Argentina.—BUENOS AIRES.—March 4th. National Sanitation Works Department. Five electrically driven pumping sets. (T.Y. 2293.)*

March 15th. Four electrically driven pumping sets. (T.Y. 2294.)*

Australia.—BRISBANE.—March 30th. City Electric Light Co. 11,000-V outdoor type switchgear. (T.Y. 31127.)*

MELBOURNE.—April 20th. State Electricity Commission of Victoria. Automatic telephone equipment. (T.Y. 31126.)*

Aylesbury.—February 24th. Electricity Department. Electrical materials for twelve months. (See this issue.)

Barry.—February 13th. U.D.C. Stores, including electric lamps, bells, conduit fittings, &c., for one year. E. R. Hinchsliff, surveyor to the Council, Council Offices.

Beckenham.—February 22nd. Borough Council. Cut-outs, cookers, cable and meters for one year. (See this issue.)

Bedford.—February 22nd. Electricity Department. Cables, joint boxes and electric lamps for one year. (See this issue.)

Billinge and Winstanley.—February 8th. U.D.C. Electrically driven borehole pump and accessories to deliver 10,000-gal. per hour. Surveyor, Council Offices, Billinge.

Blackburn.—March 1st. Electricity Committee. Twelve months' supply of cables, wire and meters. (See this issue.)

Bristol.—February 8th. Corporation. 6.6-kV and 11-kV transformers. (January 22nd.)

March 1st. Switchgear. (See this issue.)

Bromley.—February 8th. Electricity Department. Cables. (January 29th.)

Cardiff.—February 8th. R.D.C. Electric wiring in consumers' premises under the assisted wiring scheme during twelve months. H. Jackson, electrical engineer and manager, 20, Park Place (deposit £1 1s.).

February 8th. R.D.C. Electricity Department. Supplies during one year. (January 22nd.)

February 18th. Transformers. (See this issue.)

Cheadle and Gatley.—February 16th. U.D.C. Electricity Department. Twelve months' supply of electrical stores. (January 29th.)

Clitheroe.—February 13th. Electricity Department. One year's supply of electrical materials. (January 29th.)

Dewsbury.—February 10th. Town Council. One electrically driven unchokeable pump unit with a capacity of 250-gal. per min. Manager, Sewage Disposal Works, Mitchell Laithes.

Edinburgh.—February 15th. City Council. Pneumatic ash handling plant for the Portobello generating station. (January 22nd.)

February 10th. Electric goods and passenger lift at the Portobello power station. City architect.

Egypt.—CAIRO.—March 6th. Ministry of Public Works. Arc welding set. (T.Y. 31130.)*

Erith.—February 12th. U.D.C. Electricity Department. Dismantling and removal from site and making good of site, of 1,180 yds. of overhead line. (January 22nd.)

March 1st. Electrical materials for one year. (See this issue.)

Farnworth.—February 10th. U.D.C. Electricity Department. Electrical stores for twelve months. (January 29th.)

Fife.—February 16th. County Council. Electric lighting at Guardbridge school. G. Sandilands, County master of works, Property and Works Department, County Offices, Kirkcaldy (deposit £1 1s.).

Gloucester.—City Council. One 6,000-kVA transformer. (January 29th.)

Gravesend.—February 20th. Corporation. Transformers and kiosks. (See this issue.)

Harrogate.—February 20th. Corporation. One year's supply of electric lamps. C. E. Rivers, borough surveyor, Municipal Offices.

Heston and Isleworth.—February 15th. Borough Council. Electrically driven tower wagon. (January 29th.)

Hove.—February 22nd. Electricity Committee. Switchboard, reactors and cables. (See this issue.)

Keighley.—February 10th. Electricity Committee. One year's supply of v.i.r., metal sheathed and tough rubber cables. H. Webber, borough electrical engineer and manager, Electricity Offices, Coney Lane.

Kettering.—February 19th. U.D.C. Electricity Department. Transformer, cables and a.c. meters. (January 22nd.)

Kingston-upon-Thames.—March 3rd. Corporation. Substation equipment. (See this issue.)

Leeds.—February 16th. Corporation. Various stores for twelve months. (January 29th.)

Leyton.—February 9th. Corporation. Two 500-kVA transformers and h.v. switchgear. (January 29th.)

Liverpool.—February 22nd. Corporation. Trucks, air-brake and electrical equipment for 100 tramcars. (January 29th.)

London.—POPLAR.—February 10th. Borough Council. Stores for twelve months. (January 22nd.)

KENSINGTON.—February 10th. Borough Council. Various works and stores, including electrical goods, lamp fittings and columns for one year. Town Clerk's Office, Town Hall, W.8.

HACKNEY.—February 24th. Borough Council. Electrical stores for one year. (See this issue.)

BETHNAL GREEN.—February 16th. Borough Council. Meters. (See this issue.)

Long Eaton.—February 12th. U.D.C. Electricity Department. Twelve months' supply of cut-outs, meters and cables. (January 29th.)

Manchester.—February 9th. Transport Committee. General stores, including armature and field coils, controller fingers, switches, tubing, cells, insulation material, carbon brushes, overhead equipment, electrodes, cable, wire, &c. General manager, Corporation Transport Department, 55, Piccadilly.

Middlesex.—February 22nd. County Council. 1,000-mA X ray unit and associated equipment and modification of existing apparatus at the West Middlesex County Hospital, Isleworth. (January 22nd.)

February 20th. Electrical installations and replacement of d.c. distribution system and apparatus by a.c. equipment at the Central Middlesex County Hospital. (January 22nd.)

February 8th. Electric lighting, heating and power, telephone and bell installations at Tottenham Polytechnic, and electrical installations at Wembley Park County school. (January 29th.)

Mitcham.—February 10th. Town Council. Installation of traffic signals, including pedestrian-operated signals, at the junction of Manor, Northborough and Rowan Roads. Borough engineer, Town Hall.

New Zealand.—DUNEDIN.—February 24th. Tramways Department. Trolley wire. (T.Y. 31078.)*

Oldham.—February 9th. Electricity Committee. Cable. (January 29th.)

Plymouth.—February 6th. Corporation. Cables, meters, time switches and wireless rectifiers. (January 22nd.)

Portland.—February 23rd. U.D.C. One year's supply of electrical goods, also transformers and switchgear, pillars and units, cables and joint boxes. (See this issue.)

Prestwich.—February 24th. U.D.C. Electric lamps, lighting lanterns and brackets for one year. H. Kay, engineer and surveyor, Town Hall.

Rowley Regis.—February 11th. Corporation. Duplicate sets of vertical spindle pumps and electric motors with automatic float switchgear, &c. L. J. Taylor, borough surveyor, Haden Hill Park Offices, Old Hill.

Salford.—February 17th. City Council. Electrical stores. (January 29th.)

February 9th. Central Purchasing Committee. Traction lamps and tramcar accessories for one year. General manager, Transport Offices, Frederick Road.

Sheffield.—February 8th. Transport Committee. General supplies, including tramcar resistances. H. Watson, general manager, Division Street.

Skegness.—March 6th. U.D.C. Electrically driven centrifugal and reciprocating sewage and sludge pumping machinery, including stand-by electric generating plant and appurtenant mechanical appliances for the main pumping station and new sewage disposal works. W. H. Radford & Son, Albion Chambers, King Street, Nottingham (deposit £5 5s.).

Smethwick.—February 15th. St. Chad's Hospital Sub-Committee. Wireless receiving apparatus for the hospital, capable of supplying fifteen loudspeakers and sixty headphones. Secretary, St. Chad's Hospital, Hagley Road, Birmingham.

South Africa.—CAPETOWN.—February 24th. Electricity Department. Circuit-breakers for house service connections. (T.Y. 31091.)*

JOHANNESBURG.—February 13th. City Council. Transformers. (T. 31084.)*

February 23rd. Rand Water Board. Transformers. (T.Y. 31123.)*

PRETORIA.—February 26th. Union Tender & Supplies Board. Telegraph and telephone line material. (T.Y. 31122.)*

Southampton.—February 9th. Electricity Department. Electricity meters and domestic electric cookers. (January 29th.)

Spenborough.—February 17th. U.D.C. Electric pumping plant for the Public Baths, Cleckheaton. A. Rothera, surveyor to the Council, Church Street, Cleckheaton.

Stockport.—February 15th. Transport Committee. Twelve months' supply of lighting, traction and omnibus lamps. C. W. Wroth, general manager, Transport Offices, Mersey Square.

Stoke-on-Trent.—February 10th. Electrical Engineer's Department. Twelve months' supply of mains and cables, transformers and meters. (January 29th.) Overhead house-to-house services for private and Corporation housing estates. City electrical engineer, St. George's Chambers, Kingsway (deposit £2 each contract).

Stretford.—February 15th. Borough Council. Steel poles for street lighting. E. Parker, borough surveyor, Town Hall.

Sutherland.—February 9th. County Council. Electric lighting at two blocks of houses. E. W. Brannen, architect, Dornoch.

Uruguay. — MONTEVIDEO. — March 2nd. State Electricity Supply and Telephones Administration. L.c. cable. (T.Y. 31100.)*

Wallasey.—February 16th. Borough Council. Transformers. (See this issue.)

West Lothian.—February 6th. County Council. Electric lighting installations in 222 houses. F. Smith & Brown, 4 Regent Street, Hamilton.

Salford.—February 24th. City Council. Electrical stores. (See this issue.)

February 18th. Transformers, switchboard and circuit-breaker cubicle equipment. (See this issue.)

West Riding.—February 15th. Public Assistance Committee. Electric lighting and automatic refrigeration plant at the County Institution, Hemsworth. P. O. Platts, architect, County Hall, Wakefield.

February 22nd. County Council. Electric lighting and l.p. hot water apparatus at the Armthorpe New Senior Girls' school. Education officer, County Hall, Wakefield.

Weymouth and Melcombe Regis.—February 22nd. Electricity Department. E.h.v. switchgear and transformers. (See this issue.)

February 13th. Cable. (See this issue.)

Winchester.—February 12th. Electricity Department. Underground cables during thirteen months. (January 22nd.)

Wolverhampton.—February 19th. Borough Council. One year's supply of electrical and engineering stores. (See this issue.)

Worsley.—February 10th. U.D.C. Various stores, including electric lamps, for twelve months. J. Howard, surveyor to the Council, Town Hall, Walkden.

*Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Amble (NORTHUMBERLAND).—U.D.C. Accepted. Electric cables (£2,009).—B.I. Cables.

Barking.—Electricity Committee. Accepted. Two switch panels (£170).—New Switchgear Construction Co.

Birkenhead.—Electricity Committee. Accepted. Four switch units (£1,234).—A. Reyrolle & Co. Ten "Megger" testing sets (£67).—Evershed & Vignoles.

Gosforth (NORTHUMBERLAND).—U.D.C. Accepted. Electrical installations in ninety-four houses on the Hollywood Avenue estate.—B. L. Oliver.

Guildford.—Fire Brigade Committee. Accepted. Electrical installations at Fire Station (£619).—Bowden & Higlett.

London.—BERMONDSEY.—Electricity Committee. Accepted. Mercury-arc rectifier (£3,685).—Hewittic Electric Co.

POPLAR.—Contracts Committee. Electrical installations at new Town Hall:

	£		£
Electrical Installations. Accepted	**9,056**	Duncan Watson, (Electrical Engineers)	10,224
Berkeley Electrical Engg. Co.	9,750	W. J. Furze & Co. (London)	10,702
Grierson, Ltd.	9,833	T. Clarke & Co....	10,972
Constable Hart & Co.	10,026	Bower Engg. Works (Electrical & General)	11,754
G.E. Taylor & Co.	10,185		
Troughton & Young	10,504		

HAMMERSMITH.—Electricity Committee. Three-phase, h.v. switchgear (rupturing capacity 250,000-kVA), for the generating station:

	£		£
Standard Switchgear	2,309	New Switchgear Construction Co.	5,584
Ferguson, Pailin. Recommended	**5,369**	Park Royal Engg. Co.	5,657
General Electric Co.	5,380	British Thomson-Houston Co. ...	5,736
Met.-Vick. Elecl. Co.	5,380	Allen West & Co.	5,767
English Electric Co.	5,380	Harland Engineering Co. ...	5,858
Switchgear & Cowans	5,510	Bertram Thomas	6,025
Johnson & Phillips	5,548	A. Reyrolle & Co.	6,037

Three-phase h.v. metal-clad switchgear (rupturing capacity 150,000-kVA), for the supply to 126 flats to be erected in Goldhawk Road:

	£		£
Crompton Parkinson	750	English Electric Co.	1,096
Switchgear & Cowans	803	A. Reyrolle & Co.	1,096
Standard Switchgear	1,063	Met.-Vick. Elecl. Co.	1,096
Ferguson, Pailin	1,092	Allen West & Co.	1,132
Bertram Thomas	1,092	New Switchgear Construction Co.	1,141
General Electric Co. Recommended	**1,096**	Park Royal Engg. Co.	1,145
Johnson & Phillips	1,096	British Thomson-Houston Co. ...	1,166
		Harland Engineering Co. ...	1,204

Recommended. Two 1,000-kVA. three-phase, oil-cooled transformers (£900).—Yorkshire Electric Transformer Co.

One sheet-steel transformer kiosk, complete with h.v. and l.v. switchgear in connection with the supply at Phœnix Lodge Mansions, Brook Green:

	£		£
Standard Switchgear	190	Crompton Parkinson	311
W. Lucy & Co. Recommended ...	**229**	Electric Construction Co. ...	317
British Thomson-Houston Co. ...	271	Johnson & Phillips	320
Foster Engineering Co.	286	Met.-Vick. Elecl. Co.	326
Yorkshire Switchgear & Engg. Co.	288	New Switchgear Construction Co.	346
General Electric Co.	292	Bertram Thomas	625
English Electric Co.	302	A. Reyrolle & Co.	625
Ferguson, Pailin	302		

L.C.C.—Housing and Public Health Committee. Wiring and fittings for electric lighting, &c., in about 618 existing dwellings at Bellingham (No. 1 contract):

	£		£
Newman & Watson. Accepted ...	**5,092**	Evans & Shea	5,990
Holliday & Son (Electrical) ...	5,312	A. Hawkins & Sons	6,058
City Electrical Co.	5,317	Springvale Electrical Co. ...	6,075
Electrical Installations	5,699	Ryland's Electrical Co.	6,195
H. J. Cash & Co.	5,759	S. Reed & Sons	6,528
Ellis & Ward	5,803	Jacob, White & Co.	6,718
Ilford Electrical Co.	5,811	South Metropolitan Electric Light & Power Co.	6,983
Buchanan & Curwen	5,817		
Francis Polden & Co.	5,844	The chief engineer's comparable estimate is £5,562.	
A. Meckhonik	5,882		
Read & Partners	5,939		

L.C.C.—Wiring and fittings for electric lighting, power, clocks, fire alarms, domestic bells and patient's signalling system at the Western Hospital and ambulance station, Fulham:

	£		£
A. Hawkins and Sons. Accepted	**8,975**	Read and Partners	10,234
Malcolm and Allan (London)...	9,756	Troughton and Young	10,298
Pinching and Walton	9,858	Electrical Installations ...	10,401
A. Meckhonik (figures only) ...	9,980	T. Clarke and Co.	10,473
City Electrical Co.	10,069	H. J. Cash and Co.	10,504
W. J. Furse and Co. (London)	10,091	Bell, Bros. and Co. (London)...	10,940

Wiring and fittings for rewiring of balcony lighting of twelve wards and installation of lighting sockets in six wards at the St. James' Hospital, Balham:

	£		£
A. Hawkins and Sons. Accepted	**449**	S. Reed and Sons	485
J. E. Swann and Co.	449	C. J. Ferguson and Sons	487
Grant and Blake	455	Francis Polden and Co.	498
Davis Myer and Co.	485	G. E. Thomas and Co. ...	683

Wiring and fittings for electric lighting and power at St. Clement's Hospital, Poplar:

	£		£
S. Reed and Sons. Accepted ...	**589**	Malcolm and Allan (London) ...	640
Gillham and Jones	620	F. G. Edey and Co.	700
Service Electric Co.	630	Springvale Electrical Co.	704
A. J. Hewens and Sons	635	A. Meckhonik	728

Wiring and fittings for a synchronised electric clock system at the Grove Hospital, Tooting Graveney:

	£		£
A. Hawkins and Sons. Accepted ...	**798**	Read and Partners	885
Malcolm and Allan (London) ...	810	Electrical Installations	890
Buchanan and Curwen	835	Berkeley Electrical Engg. Co. ...	893
Pinching and Walton	850	S. Reed and Sons	895
W. J. Furse and Co. (London) ...	870	Synchronome Co.	1,029
A. Meckhonik	871		

Wiring and fittings for electric lighting, &c., at Carlyle school:

	£		£
E. and C. Champion. Accepted ...	**1,007**	Electrical Installations	1,490
A. Cozens	1,203	Buchanan and Curwen	1,536
A. Meckhonik	1,347	F. Angell and Co.	1,551
Carr Bros....	1,432		

Middlesex.—Education Committee. Electrical installations at the Technical Institute, Twickenham:

	£		£
Colston Electrical Co	6,625	Bective Electrical Co.	8,302
F. Troy & Co. Accepted... ...	**6,630**	G. E. Wallis & Sons	8,794
F. H. Wheeler & Co.	7,509	J. Holder & Co....	10,096
G. A. Weston	8,046		

Sanquhar (DUMFRIESSHIRE). — Town Council. Accepted. Electric lighting in thirty houses at Renwick Place (£188).—J. Fergusson.

Stoke-on-Trent. — Electricity Committee. Recommended. Lamp columns and lamps for lighting roads: Victoria, Fenton (£1,021), and Hartshill, Stoke (£696).—B.T.H. Longton to Meir (£1,185).—G.E.C.

Forthcoming Events

Institution of Electrical Engineers.—Thursday, February 11th. Institution, London, W.C.2. 6 p.m. "Fire Precautions in Major Electrical Stations." Mr. F. C. Winfield.

Mersey and North Wales (Liverpool) Centre.—Monday, February 8th. Central Hall, Liverpool. 7.30 p.m. Faraday Lecture. "Electricity in the Hospital." Mr. R. S. Whipple.

North-Eastern Centre.—Monday, February 8th. Armstrong College, Newcastle-upon-Tyne. 6.15 p.m. Paper by Mr. F. C. Winfield.

Western Centre.—Monday, February 8th. South Wales Institute of Engineers, Cardiff. 6 p.m. "The Electrical Characteristics of 132-kV Line Insulators Under Various Weather Conditions." Mr. J. S. Forrest.

East Midland Sub-Centre.—Tuesday, February 9th. Electricity Showroom, Derby. "New Knowledge on Atomic Structures and Chemistry." Mr. A. Brookes.

Scottish Centre.—Tuesday, February 9th. Royal Technical College, Glasgow. 7.30 p.m. Informal discussion. "Mercury Arc Rectifiers." To be opened by Prof. S. Parker Smith and Mr. E. Fairley.

Hampshire Sub-Centre.—Wednesday, February 10th. University College, Southampton. 7.30 p.m. "Lightning." Mr. B. L. Goodlet.

Transmission Section.—Wednesday, February 10th. Institution, London, W.C.2. 6 p.m. "The Control Rooms and Equipment for the British Grid System." Mr. J. D. Peattie.

Dundee Sub-Centre.—Thursday, February 11th. University College, Dundee. 7.30 p.m. "From Street Pillar to Meter Board—The Evolution of a Distribution System to Meet Domestic Demand." Mr. W. S. Kelly.

Meter and Instrument Section.—Friday, February 12th. Institution, London, W.C.2. 7 p.m. "Performance of Secondary Noise Meters in Terms of the Primary Standards." Messrs. B. A. G. Churcher and A. J. King.

Sheffield Sub-Centre.—Friday, February 12th. Royal Victoria Hotel, Sheffield. Annual supper-dance.

Electrical Engineers' Ball.—Friday, February 5th. Grosvenor House, London, W.1.

Junior Institution of Engineers.—Friday, February 5th. Institution, London, S.W.1. 7.30 p.m. Informal meeting. "The Central Electricity Board Grid Transmission System." Mr. L. M. Jockel. Friday, February 12th. Institution. 7.30 p.m. "Causes of Deterioration in P.I. Cable." Prof. R. O. Kapp.

Electrical Power Engineers' Association (*London Technical Group*).—Saturday, February 6th. Café Royal, London, W.1. Annual dinner and dance. Tuesday, February 9th. Caxton Hall, London, S.W.1. 7.15 p.m. "Power Factor Correction." Mr. R. A. Lochner.

Institution of Heating and Ventilating Engineers.—Wednesday, February 10th. Institution of Mechanical Engineers, London, S.W.1. 2.30 p.m. "Thermal Conductivity of Insulating Materials and Methods of Testing." Mr. E. Griffiths. Connaught Rooms, London, W.C.2. 6.30 for 7 p.m. Annnal dinner.

Electrical Association for Women.—Thursday, February 11th. 20, Regent Street, London, S.W.1. 3 p.m. Annual general meeting.

Association of Mining Electrical Engineers (*South Wales Branch*).—Saturday, February 13th. Queen's Hotel, Cardiff. 7 p.m. Annual dinner.

Finsbury Technical College Old Students' Association.—Saturday, February 13th. Trocadero Restaurant, London, W.1. Annual dinner.

Notes

North-eastern Centre I.E.E. Dinner

Reference to the growth in the use of electricity in mines was made by Colonel Sir Frank Simpson when he proposed the toast of "The Institution" at the annual dinner of the North-Eastern Centre of the I.E.E. at Newcastle-on-Tyne on January 29th. Mr. D. Maxwell Buist, of the Central Electricity Board (North-Eastern Area), presided. Sir Frank, who is chairman of the Newcastle and District Electric Lighting Co., Ltd., also referred to the need for extensions to the electrical laboratory at Armstrong College, Newcastle. Prof. W. M. Thornton, head of the Electrical Engineering Department of Armstrong College and a past president of the I.E.E., replied in the absence of Mr. H. T. Young, the president, and said he hoped to see a building erected at Armstrong College worthy of that great centre of electrical engineering. Mr. W. H. Horsley, of C. A. Parsons & Co., Ltd., proposed "The Chairman." Representatives from London included Mr. P. F. Rowell (secretary), and three members of the Council, Dr. P. Dunsheath, Mr. G. L. Porter, and Mr. C. R. Westlake.

Electric Clock for Giza University

A clock and chime of bells constructed in England for the new University of Giza, near Cairo, will be the first of its kind in Egypt. The chime will sound the Westminster quarters and the hours will be struck on a 5¼-ton bourdon bell. The clock is a powerful electric one with mechanism specially designed to protect the 10-ft. dials from dust. An auxiliary equipment will ensure that in the event of an electricity supply failure the clock will continue to operate for twenty-four hours. The bells and clock are now under test at the foundry of Gillett & Johnston, Ltd., at Croydon, and His Excellency A. B. Rahman Bey, the Egyptian Chargé d'Affaires, with Captain Lumley, Parliamentary Private Secretary to the Secretary of State for Foreign Affairs, were to view the installation on Tuesday of this week before it is despatched to Egypt.

A.S.E.E. Dinner

The annual dinner of the Association of Supervising Electrical Engineers is to be held on February 27th at the Trocadero, London, W.1.

The E.I.B.A. (Northern Counties Area)

The annual general meeting of the Northern Counties Area of the Electrical Industries Benevolent Association was held at Grid House, 80, Jesmond Road, Newcastle-upon-Tyne, recently, under the chairmanship of Mr. D. Maxwell Buist (manager, North of England, Central Electricity Board). The chairman reported that the amount collected in the Area was a record, and together with subscriptions and donations which had been forwarded direct to London, would bring the total to approximately £1,000. Col. S. E. Monkhouse (assistant general manager, North-Eastern Electric Supply Co., Ltd.), and Mr. N. S. Tennant (general manager, Newcastle and District Electric Lighting Co., Ltd.) were unanimously elected chairman and vice-chairman, respectively. The following were elected members of the Advisory Committee:—Messrs. A. Andrews (Reid Ferens & Co., Ltd.), H. H. Baker (Merz & McLellan), F. G. H. Bedford (C. A. Parsons & Co., Ltd.), D. Maxwell Buist (Central Electricity Board), E. Charlton (British Insulated Cables, Ltd.), J. Clement (British Thomson-Houston Co., Ltd.), H. W. Clothier (A. Reyrolle & Co., Ltd.), H. A. Couves (North-Eastern Electric Supply Co., Ltd.), W. Horsfall (General Electric Co., Ltd.), F. W. Page (electrical representative), A. Parkin (local E.D.A. officer), H. Paterson (Metropolitan-Vickers Electrical Co., Ltd.), R. Robson (Robson & Coleman), W. A. Royle (Sunderland Corporation Electricity Department), W. A. Woodeson (Clarke, Chapman & Co., Ltd.), J. Gledson (J. Gledson & Co.), hon. treasurer, R. H. Davison (A. Reyrolle & Co., Ltd.), hon. secretary Relief Sub-Committee, and W. Herbert Ord (North-Eastern Electric Supply Co., Ltd.), hon. secretary.

E.A.W. Activities

Judging from the programme just received the annual conference of the Electrical Association for Women, which is to be held this year at Bristol, looks like being an even more interesting event than usual. After registration at the headquarters, Victoria Rooms, Clifton, on Wednesday, April 7th, on which day the Western Counties and South Wales Federation is holding a special conference, delegates will be welcomed in the evening by the Lord Mayor of Bristol at a civic reception at the Museum and Art Gallery. At the opening session on Thursday the Dowager Marchioness of Reading will preside and a paper will be delivered by overseas delegates on "Women's Opportunity in the Electrical Age." After luncheon a visit will be paid to the Clifton Zoological Gardens and in the evening there will be a civic reception by the Mayor and Mayoress of Bath at the Pump Room, Bath. The annual general meeting will be held on the Friday morning, followed by a branch session at which "Kitchen Planning from the Woman's Point of View" will be discussed. Cheddar Gorge and caves will be visited after an informal lunch, while in the evening delegates will be entertained by the Bristol Branch. No official arrangements have been made for the Saturday, but any spare time will be spent very pleasantly in inspecting special exhibitions of all-electric flats and bungalows, electrical and household equipment, &c. The Association's Coronation Ball will be held in London at the Park Lane Hotel on April 30th.

In announcing the result of the competition organised by the Electrical Association for Women for the purpose of finding a better name than "domestic servant," the judges state that in their view the name "home worker" or "domestic worker" cannot be improved upon to designate those who work in and for the home. As no one submitted either of these names the prize is to be divided between the competitors who suggested the two names that most nearly express the object of the competition. Two guineas have been awarded to Mrs. M. M. Hutchinson (Farnworth and District Branch) for the name "domestician," and one guinea has been divided among three competitors who suggested "household assistant"—Mrs. M. Fulford (Sheffield), Mrs. M. I. Hollander (Stafford), and Miss H. Wiseman (Ilkley).

North West Midlands J.E.A.

The Minister of Labour gives notice that as soon as may be after February 15th, he will designate to the North West Midlands Joint Electricity Authority, in accordance with Section 2 (10) of Part I of the first annex to the schedule to the North West Midlands Electricity District Order, 1928, the employés' organisations having members in the employment of authorised undertakings in the district, in order that those organisations may choose a representative of persons employed in connection with the supply of electricity in the district to be a member of the Authority. Any employés' organisation which is desirous of being considered by the Minister for designation should make application in writing to the Minister not later than February 15th on the form provided for the purpose, of which copies may be obtained from the secretary, Ministry of Labour, Montagu House, Whitehall, London, S.W.1.

E.I.B.A. (Tees-side Section) Ball

The Tees-side Section of the Electrical Industries Benevolent Association is holding its annual ball at the Middlesbrough Town Hall on February 26th.

Exhibition of Scholars' Work

The London County Council is holding an exhibition of the work of scholars in junior technical schools in London at the County Hall, S.E.1, extending over the period from February 9th to 20th.

Standards of Radio Frequency

Dr. R. L. Smith Rose announces that the transmissions made periodically from the National Physical Laboratory at Teddington (call sign G5HW) as a means of reference for standardising purposes, have not been changed. They are of two types. One takes place at 1040 G.M.T. on the second Tuesday of each month in the form of a modulation of 1 kc. of a carrier wave 758 m. long (frequency of 396 kc.) with an accuracy within one part in ten millions. After one hour of continuous radiation the frequency is changed by about 2.5 parts in a million for ten minutes to enable those who receive it to determine whether their own frequency of 1,000 cycles is above or below that of the laboratory standard. The second emission is primarily intended for amateur experimenters. It commences at 2100 G.M.T. on the first Tuesday in March, June, September and December, lasting for fifteen minutes. In this case the radio frequency is the standard of reference, of a value of 1,780 kc. (wave length approximately 169 m.), possible error not exceeding one part in a million. Announcements are made in Morse code.

The Batti-Wallahs' Society

The next luncheon of the Batti-Wallahs' Society will be held on February 10th at the Hotel Victoria, when Sir Walter J. Womersley will deliver an address on "The Fishing Industry."

Mercury-arc Rectifiers

A course of five lectures dealing with modern grid controlled mercury-arc rectifier practice will be delivered by Mr. H. Rissik, B.Sc., at the Northampton Polytechnic, E.C.1. The first lecture will begin on February 8th, and others on March 1st, 10th, and 22nd. The syllabus can be obtained from the Secretary of the Polytechnic.

Appointments Vacant

Shift charge engineer for the South Lancashire Transport Co.

Assistant accountant for Winchester Electricity Department.

Senior charge engineer for Chesterfield Electricity Department.

Mains engineer for Hammersmith Electricity Department

Principal technical assistant for Nuneaton Electricity Department.

Postal surveyor and wireless engineer for the Government of Gambia.

Lady cooking demonstrators and male outdoor representatives for Finchley Borough Council.

Lady demonstrator and male showroom assistant for Bury Corporation Electricity Department.

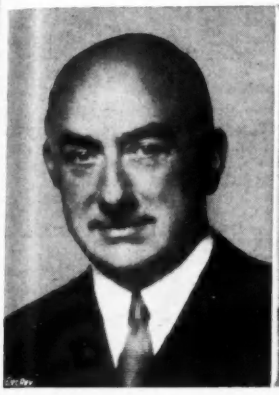
Contract-estimating engineer for Fulham Metropolitan Borough Council.

(See our classified advertisements.)

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

New Year Honours.—The Honours List which was published on Monday last includes the names of several gentlemen connected with the electrical and allied industries, among them being the following:—**Sir Harry McGowan,** K.B.E., LL.D., who receives a barony, is chairman of Imperial Chemical Industries, Ltd., and is also well known as the chairman of the Committee set up by the Minister of Transport to review the organisation and distribution of electricity. **Lt.-Col. A. G. Lee,** O.B.E., M.C., Engineer-in-Chief of the Post Office, and **Mr. J. A. Aiton,** C.B.E., governing director of Aiton & Co., Ltd., are created knights. The K.C.B. (Civil Division) is awarded to **Mr. H. T. Tizard,** C.B., A.F.C., F.R.S., Rector of the Imperial College of Science and



Sir Harry McGowan

Lt.-Col A. G. Lee

Technology. **Mr. M. F. Lindley,** LL.D., Comptroller General of Patents, Designs and Trade Marks, and Comptroller of the Industrial Property Department, Board of Trade, receives the C.B. (Civil Division). **Mr. R. W. C. Tout,** Inspector, Department of Posts and Telegraphs, Palestine, becomes an M.B.E., and **Commander R. J. Hippisley,** O.B.E., T.D., M.I.E.E., Area Traffic Commissioner, Western Area, receives the C.B.E. (Civil Division).

Mr. E. Jolly, electrical engineer and manager to the Bethnal Green Borough Council, has had his salary adjusted in accordance with the scale of salaries of the Associated Municipal Electrical Engineers.

Mr. G. N. Everitt, technical assistant to the operation and mains engineer of the Sheffield Corporation Electricity Department, has been appointed assistant mains engineer in the Fulham Corporation Electricity Department at a salary of £353 per annum.

Mr. E. Bates has resigned the position of showroom manager with the West Kent Electric Co., Ltd., of Orpington, and is now sales manager for the Isle of Thanet Electric Supply Co., Ltd., serving Margate and surrounding district.

Mr. W. H. Price, governing director of W. H. Price, Ltd., of Birmingham, and Midland area manager of the General Cable Manufacturing Co., Ltd., and his daughter are sailing on the T.S.S. *Voltaire* on February 6th for the West Indies and Mexico, and will return by March 25th.

Mr. W. J. R. Wilcocks, mains engineer with the Hammersmith electricity undertaking, is retiring on superannuation in June next.

Mr. H. R. Forbes Mackay, general manager of the Sydney County Council electricity supply undertaking, has been awarded the Peter Nicol Russell Memorial Medal of the Institution of Engineers, Australia, for 1936, states *Electrical Engineer and Merchandiser.* The medal is awarded annually for an outstanding life contribution to the science of engineering.

Mr. J. M. Crawford, who retired recently from the position of chief engineer of the Commonwealth Postmaster-General's Department, is president-elect of the Institution of Engineers, Australia for the 1937-38 session. He is visiting London for the Coronation ceremony, in which he has a peculiar interest, as he was in charge of the telephone and telegraph arrangements on behalf of the British Post Office at the Coronations of King Edward VII and King George V.

The following gentlemen, all executive members of the staff of Brookhirst Switchgear, Ltd., have been appointed to the board of that company as from February 1st: **Messrs. J. O. Knowles,** M.A., A.M.I.E.E. (technical), **H. Gawthorne** (secretary), **Allen Hirst** and **H. M. Goody** (joint sales), **G. E. Paterson** (London manager), and **M. N. Humphreys,** M.A. (technical).

Mr. J. L. Baird, inventor of the televisor and managing director of Baird Television, Ltd., was presented with the gold medal and diploma of the International Faculty of Science at a dinner given in his honour on January 30th.

Messrs. A. J. Fippard and **J. H. Edwards** have resigned from the board of the Shropshire, Worcestershire and Staffordshire Electric Power Co., and **Sir Thomas Royden** and **Mr. F. H. James** have been elected directors.

Mr. A. R. Fearnley, formerly transport manager to the Sheffield Corporation, has been engaged by the Warrington Corporation to act as consultant in the question of the co-ordination of transport services.

Mr. J. H. Maurice Clark, a director of the Clyde Valley Electrical Power Co., has been elected president of the Glasgow Chamber of Commerce.

Mr. C. E. Robertson, at present distribution engineer with the Stoke Newington electricity undertaking, has been recommended for the appointment of acting deputy borough electrical engineer for a period of twelve months at a salary of £375 per annum.

The Simplex Electric Co., Ltd., has negotiated an arrangement with H. J. Baldwin & Co., Ltd., in regard to the services of **Mr. J. Entwistle,** A.M.I.E.E., who remains a director of the latter company.

Mr. A. Taylor, proprietor of John Moores & Co., electrical and radio wholesalers, of Salford, is to marry Miss M. Irene Williams this month.

Professor W. G. Cady, of the Wesleyan University, Middletown, Connecticut, U.S.A., has been awarded the fourteenth Duddell Medal by the Council of the Physical Society.

Obituary

Mr. J. Taylor.—The death took place on January 30th of Mr. Joseph Taylor, who had been honorary secretary of the Scottish Centre of the Institution of Electrical Engineers for the past twenty-three years. Mr. Taylor, who was seventy years of age, entered the Glasgow office of the Edison Swan Electric Co., Ltd., as a young man, and for forty-six years he was the company's manager for Scotland, retiring about three years ago. As hon. secretary of the Institution in Scotland Mr. Taylor was well known in electrical circles throughout the country. He was also a member of the Scottish Council of the Electrical Industries Benevolent Association.

Mr. J. H. Bates.—The death occurred suddenly at his home at Stoke-on-Trent on January 27th of Mr. Joseph Henry Bates, head of the firm of J. H. Bates & Son, electrical engineers, of Burslem. He was at one time manager of the Burslem branch of E. M. Evans & Son, Ltd., of Manchester, but some years ago commenced business in partnership with his son. He was one of the early members of the Electrical Contractors' Association.

Mr. A. M. Willey.—We regret to learn of the death of Mr. A. M. Willey, which occurred on January 30th at the age of fifty. Mr. Willey had been resident engineer of the Shoreham and District Electric Lighting and Power Co., Ltd., since its inception eleven years ago. He served on the committee of the Shoreham Chamber of Commerce.

Mr. H. Byrne.—The death has occurred at sea, while on the way to South Africa, of Mr. Harold Byrne, a member of the engineering staff of the Ministry of Health. In 1911 he was seconded as chief engineer to the Sultan of Johore, in which position he was responsible for roads, harbours, drainage, railways, electrical supplies, &c.

Mr. C. H. Meadowcroft.—The following notice appears in the "Obituary" columns of *The Times*: "On January 29th, 1937, Charles H. Meadowcroft. Over thirty-six years' faithful service as chauffeur to W. T. Glover & Co., Ltd., Trafford Park, Manchester."

Arc Suppression

A 35-kV overhead line of the Saltos del Alberche, Madrid, which runs over a plateau to the north of El Escorial at a maximum height of 5,350 ft. above sea level, could not initially be kept in operation in blizzards or in strong winds owing to trouble from intermittent earths. Ice formed on the 0.11 sq. in. conductors may bring the overall diameters up to 16 in., and the stresses are about ten times those envisaged in the Swiss standards. When the ice falls off or in heavy winds the conductors often swing into contact with the steel work of the towers. Running with the neutral insulated (when the arc produced by 11.5 A earth current was enough to short-circuit the phases) or solidly earthed alike proved unsatisfactory. According to *A.E.G. Progress* the installation of a Petersen coil obviated these difficulties. Records taken on a stormy day indicated that 450 brief earths were recording during fifteen hours, more than 300 being in the first six hours. These were all temporary, apparently caused by flash-overs from the conductors to the towers, and the arcs were extinguished so rapidly that no circuit-breaker tripped during the period.

week by week is on an increasing scale. In the majority of cases over-subscription is secured and a premium established when dealings in the shares begin.

Debenture Stocks

Debenture stocks of most of the principal electricity supply and equipment shares rest in firm hands; big lines of stock are not coming to market in appreciably greater volume than they were before depression in gilt-edged issues became pronounced. Such stock as comes in can usually be placed without undue difficulty at prices not much lower than formerly. The 4 per cent. and 3½ per cent. issues of the London Power Company have been slightly lowered. The former, now at 107½, yields £3 14s. 3d. per cent.; the latter is down to 101, free of stamp duty, the return being £3 4s. 3d. per cent. on the money. Central Electricity stocks are mostly a point lower on the week. London Passenger Transport issues have similarly drooped.

Cheaper Preference Shares

The malaise in Government stocks having spread practically throughout the field of fixed-interest securities, many industrial preference shares are offered more cheaply than they were a short time back. In the electrical equipment group, preference shares of which sizeable lines are now on offer include British Thomson-Houston 7 per cents.; these can be bought at 31s. 6d., whereas 34s. 6d. was being asked about a month ago. Other instances of shares which are offered at prices a shilling or two lower than their recent levels are Crompton Parkinson 6 per cent. second preference, at 27s. 6d.; General Electric "A" and "B" preference, at 31s. 6d. and 37s. respectively; and British Electric Transformer 5 per cent. preference, at 24s. 3d. The list could easily be extended; reference is made here only to those issues which can presently be obtained in fair quantity. The average yield on the good-class investments in this group works out at a little above 4 per cent.

Cable and Wireless

For some unexplained reason, a demand sprang up on Tuesday afternoon for Cable & Wireless "A" ordinary stock, lifting the price to 24¼. The "B" is a shade harder at 7¼, and the preference stock retained last week's gain of 2½ points. Marconi Marine fell back ¼ to 38s. 9d.: Canadian Marconis rallied to 9s. 3d. after being lower. Gt. Northern Telegraphs have fallen back to 45¾. Anglo-American Telegraph issues went ex dividend at the beginning of this week.

Equipment Price Movements

Although conditions in the electrical equipment market are anything but animated, there is little disposition on the part of holders towards realisation of their shares. These, in contrast with equities in some other branches of the industrial market, continue to command sufficient support to mitigate the usual tendency of prices to yield ground in periods of slackened activity. Cable shares have again attracted a good deal of interest during the past week: a feature was British Insulated, which continued their steady rise up to 6¼, on bonus hopes. Callenders also strengthened, but Johnson & Phillips eased off to 52s. Crabtree Electric reacted from 36s. to 35s. Westinghouse Brakes, at 75s. 6d., recovered most of an earlier decline; Consolidated Signals were maintained steadily at 142s. 6d., on the approach of the dividend announcement. Dull spots in the market are Aron Meters, now 2⅞, Telegraph Constructions, 32s. 6d., and Enfield Rolling Mills, 15s. 9d.

T. Tilling's Dividend

The ordinary capital of Thomas Tillings was increased, at this time last year, by the distribution of a one-in-four capital bonus; so that the maintenance of the dividend for the year at 10 per cent., the same as previously, represents a satisfactory achievement. It was not, however, so satisfactory as to please everyone, for the price of the ordinary slumped, on the announcement, by nearly 5s. Publication of the accounts brought about a partial rally to 71s. 6d. The balance sheet is not particularly illuminating, but shows, for one thing, that the strength of reserves is still considerable despite the scrip bonus distributions of recent years. Investments stand at a higher figure than last year, although part of the London Transport "C" stock holding has, since then, been offered to shareholders.

Miscellaneous Matters

A line of Mersey Power Company ordinary, of £1 each, has come on offer at 35s. ex dividend, and a good many shares were taken on this basis. Dealings are for the end of March settlement. The company paid 7 per cent. last year and will probably repeat this rate, making the yield, at 35s., four per cent. on the money. The Ever Ready Company is expected to pay a final dividend of 30 per cent., making 45 per cent. for the year. The new shares are not entitled to this, and can be bought at 30s. 6d., a florin less than the old shares. The latter carry the additional dividend of, probably, 1s. 6d. gross —say 1s. 2d. net. Hence the new shares are about 10d. cheaper than their seniors.

Brazilian Tractions have spurted to 24¼, on strong buying from New York as well as London. Foreign descriptions are mostly steady. Rubber shares give little sign of attracting public attention just yet.

Share List of Electrical Companies

HOME ELECTRICITY COMPANIES.

	Dividend. Nom.	Previous.	Last.	Price. Feb. 2.	Rise or Fall.	Yield. p.c. £ s. d.
Bournemouth and Poole	1	15	15	77/6	—	3 17 5
City of London	1	7½	7½	38/–	—	3 19 0
Clyde Valley	1	7	8	45/6	—	3 9 7
County of London	1	10½	10½	54/–	—	3 17 9
Edmundson's 7% Pref.	1	7	7	35/–	−6d.	4 0 0
Do. Ord.	1	8	8	44/6	—	3 12 0
Elec. Dis. Yorkshire	1	9	9	45/6	—	3 19 0
Elec. Fin. and Securities	1	12½	12½	3⅛	—	4 1 7
Elec. Supply Corporation	1	11	11	58/3	—	3 15 7
Lancs Light and Power	1	7½	7½	38/–	—	3 19 0
Lond. Assoc. Electric	1	—	7	35/–	—	4 0 0
London Electric	1	7	8	40/–	—	4 0 0
London Power Deb. Red.	Stock	5	5	106½	−1	4 14 0
Metropolitan	1	10	10	50/6	—	3 19 2
Midland Counties	1	7	7½	40/6	—	3 14 0
Mid. Elec. Power	1	8	8	42/6	—	3 15 3
North Eastern Electric Ordinary	1	6	6	33/6	—	3 11 10
Do. 7% Pref.	1	7	7	35/–	—	4 0 0
Northampton	1	10	10	51/3	—	3 18 2
Notting Hill 6% Pref.	10	6	6	14	—	4 5 9
North Met. Elec. Ordinary	1	10	10	54/–	−1/6	3 14 0
Do. do. 6% Pref.	1	6	6	31/6	—	3 16 2
Scottish Power	1	8	8	42/–	—	3 16 2
South London	1	7	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	23/–	—	6 10 4
Yorkshire Elec.	1	8	8	44/6xd	+3d.	3 11 10

PUBLIC BOARDS.

Central Electricity, 1950–70	Stock	5	5	116½xd	—	4 5 10
Do. 1955–75	„	5	5	120	−1	4 3 4
Do. 1951–73	„	4½	4½	112	−1	3 19 8
Do. 1963–93	„	—	3½	102	—	3 8 8
London Elec. Trans. Gtd.	„	—	2½	91	—	2 14 9
London & Home Counties, 1955–75	„	4½	4½	114	—	3 19 0
London Passenger Transport, A	„	—	4½	120½	−1	3 14 8
Do. do. B	„	—	5	121½	−1	4 2 4
Do. do C	„	3½	4	97	—	4 2 6
West Midlands Joint Elec. 1948–68	„	—	5	116¼	—	4 5 10

TELEGRAPH AND TELEPHONE.

American Tel. & Tel.	$100	9	9	187½	—	4 16 0
Anglo-Am. Tel. Pref.	Stock	6	6	127½xd	—	4 14 1
Do. Def.	„	1½	1½	31½xd	—	4 15 4
Cable & Wireless 5½% Pref.	„	4½	5½	107½	—	5 2 4
Do. A. 7½% Ord.	„	Nil	Nil	24½	+⅜	—
Do. B. Ord.	„	Nil	Nil	7½	+⅛	—
Globe Tel. & Tel. Ord.	10	3½*	4½*	14½	—	3 2 1
Do. Do. Pref.	10	6	6	14½	—	4 2 9
Great Northern Tel.	10	20	20	45⅜	−½	4 7 5
Marconi-Marine	1	10	7½	1 ⅜	−⅛	3 17 5
Oriental Telephone Ord.	1	12*	12*	3⅛	—	3 12 6

HOME AND FOREIGN TRAMS, ETC.

Anglo-Arg. Trams First Pref.	5	Nil	Nil	5/9	—	—
Do. do. 2nd Pref.	5	Nil	Nil	3/9	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	24½	−3	—
British Electric Traction Df. Ord.	„	5	5	1575	—	—
Do. do. Pref. Ord.	„	8	8	169½	−3	4 14 5
Brazil Traction	100	—	70 cts.	24½	+2	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	105½	—	4 14 9
Mexican Light Common	100	Nil	Nil	3½	—	—
Do. 1st Bonds	$500	5	5	47	—	—
Victoria Falls Ord	1	20	12	76/3	—	3 3 2
West Riding	1	5	6½	47/6	—	2 14 8

MANUFACTURING COMPANIES.

Aron Electricity Ord.	1	10	15	2⅞	−½	5 4 4
Assoc. Elec. Ord.	1	6	8	52/6	−6d.	3 1 4
Do. Pref.	1	8	8	39/–	—	4 2 0
Babcock & Wilcox	1	8	8	51/3	—	3 2 5
British Aluminium Ord.	1	7½	7½	44/6	—	3 7 8
British Insulated Ord.	1	15	20	6¼	+⅛	2 19 9
Brush Ord.	Stock	Nil	Nil	37½	—	—
Callender's	1	15	15	4⅝	+⅛	3 1 6
Do. 6½% Pref.	1	6½	6½	32/6	—	4 0 0
Crompton Parkinson Ord.	5/–	12½	12½	75/–	—	—
Do. 8% Pref.	1	8	8	37/6	—	4 5 4
Electric Construction	1	3½	7	42/6	—	3 5 9
Enfield Cable Ord.	1	25	25	5¼	—	4 17 0
English Electric	1	Nil	Nil	32/–	—	—
Do. Do. Pref.	1	6½	6½	26/–	−6d.	5 0 0
Ericsson Tel.	5/–	24	20*	58/9	—	1 14 0
Ever Ready	5/–	35	35	32/6	—	5 7 8
Ferranti Pref.	1	7	7	26/3	—	5 6 8
G.E.C. Pref.	1	6½	6½	31/3	—	4 3 2
Do. Ord.	1	10	15	91/–	−6d.	3 6 0
Henleys	5/–	30	30	21/6	−1/–	3 9 8
Do. 4½% Pref.	1	4½	4½	1½	—	3 12 0
India-Rubber Pref.	1	1⅝	5½	23/3	—	4 17 9
Johnson & Phillips	1	7½	10	52/–	−⅛	3 17 0
Lancashire Dynamo	1	5	10	3⅜	−⅛	2 19 2
Siemens Ord.	1	4	6	33/9	—	3 11 0
Telegraph Construction	£1	Nil	Nil	32/6	−⅛	—

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken

1935

10391. "System and apparatus for controlling at a distance one or more electric circuits by means of sound waves." C. Beltrami. April 4th, 1934. (Cognate application 10392-35.) (459493.)

10452. "Thermally operated devices for controlling electrical circuits." Bresson & Cie and S. J.-B. Thomas. June 12th, 1934. (459226.)

12228. "Regulating switches for electric transformers." B. Jansen. April 20th, 1934. (459227.)

15971. "Two-motion switches of the type used in telephone systems and circuit arrangements therefor." Standard Telephones & Cables, Ltd., and J. R. Gould. June 1st, 1935. (459233.)

16197. "Radio wave signalling systems." Wallace & Tierman Products, Inc. June 11th, 1934. (459235.)

16449. "Electrical arrangement for controlling incandescent lamp screens adapted to reproduce pictures." Reklamaktiebolaget Epok. June 6th, 1934. (459291.)

18757. "Control means for automatically regulating the speed of the spindles of electrically driven ring-spinning or the like machines." General Electric Co., Ltd., and H. C. E. Jacoby. July 1st, 1935. (459438.)

18783. "Electric incandescent lamps." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. July 26th, 1934. (459362.)

18881. "Electrical musical instruments." J. Compton Organ Co., Ltd., and L. E. A. Bourn. July 2nd, 1935. (459439.)

18898. "Bayonet-type electric lampholders." General Electric Co., Ltd., and L. V. Ricards. July 2nd, 1935. (459440.)

18996. "Regulation of rectifiers by means of grids." Allmänna Svenska Elektriska Aktiebolaget. November 1st, 1934. (Cognate application 18997-35.) (459443.)

19054. "Electric arc cutting machine." K. Strobel. July 3rd, 1935. (459292.)

19074. "Power plant." R. W. Bailey, K. Baumann and Metropolitan-Vickers Electrical Co., Ltd. July 3rd, 1935. (459365.)

19097. "Welding rods." Electro Metallurgical Co. July 28th, 1934. (459366.)

19100. "Welding of alloy steels." Electro Metallurgical Co. August 1st, 1934. (459367.)

19128. "Apparatus for carrying out welding or coating of metals and chemical reactions electrically." A. Kratky. July 4th, 1935. (459446.)

19217. "Ignition magnetos" J. Lucas, Ltd., and A. Massey-Allen. July 5th, 1935. (459295.)

19249. "Switches such as are used in automatic telephone systems. Standard Telephones & Cables, Ltd. (L. J. J. Schreiber.) July 5th, 1935. (459296.)

19282. "Electric selectors." Telefonaktiebolaget L. M. Ericsson. July 6th, 1934. (459299.)

19292. "Radio receivers." L. R. Merdler, M. Scott, and Baird Television, Ltd. July 5th, 1935. (459300.)

19293. "Television or like systems." J. C. Wilson and Baird Television, Ltd. July 5th, 1935. (459506.)

19307. "Method of, and apparatus for, the electrical precipitation of suspended particles from gases." Lodge-Cottrell, Ltd. (Research Corporation of New York.) July 5th, 1935. (459301.)

19309. "Electrical impulse generators." Marconi's Wireless Telegraph Co., Ltd., and G. B. Banks. July 5th, 1935. (459302.)

19310. "Piezo-electric crystal arrangements suitable for use in high-frequency signalling apparatus." Marconi's Wireless Telegraph Co., Ltd., and T. D. Parkin. July 5th, 1935. (459303.)

19422. "Electric signalling or controlling systems." Electrofio Meters, Ltd., and R. J. Wey. July 8th, 1935. (Addition to 454012.) (459579.)

19437. "High-tension electric switches." A. West & Co., Ltd., and V. Breeze. July 8th, 1935. (459369.)

19475. "Metal wall boxes for use in the flush-mounting of tumbler-switches, coupling sockets and similar electrical units." Electric Supplies (Bloxwich), Ltd., H. Wootton and H. Garratt. July 8th, 1935. (459517.)

19484. "Coaxial conductor electric cables." Standard Telephones & Cables, Ltd., and W. K. Weston. July 8th, 1935. (459518.)

19485. "High-frequency coaxial cable transmission systems and apparatus therefor." Standard Telephones & Cables, Ltd., T. R. Scott and T. E. D. Menzies. July 8th, 1935. (459580.)

19645. "Intervalve coupling and like circuits." J. Hardwick and E. L. C. White. July 9th, 1935. (459581.)

19646. "Electric circuits for modifying frequency response in amplifiers and the like." J. Hardwick and E. L. C. White. July 9th, 1935. (459526.)

19740. "Cathode-ray tube oscillograph apparatus." Marconi's Wireless Telegraph Co., Ltd. July 27th, 1934. (459535.)

19754. "Cathodes for thermionic tubes." Allgemeine Elektricitats-Ges. July 11th, 1934. (459539.)

19843. "Rheostatic braking arrangements for electric motors." British Thomson-Houston Co., Ltd. July 11th, 1934. (459546.)

21856. "Electrical resistances and heater elements." Expanded Metal Co., Ltd., and B. H. N. H. Hamilton. August 1st, 1935. (459374.)

22634. "Metering systems in telephone installations." C. E. Every-Clayton (F. Merk Telefonbau Akt.-Ges.) August 10th, 1935. (459375.)

24666. "Caps for electric incandescent lamps and the like." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen.) September 4th, 1935. (Addition to 417436.) (459316.)

25487. "Electric immersion heating apparatus." F. N. R. Baker and C. F. Whitehead. September 13th, 1935. (459243.)

25697. "Electrical circuit arrangements." Siemens & Halske Akt.-Ges. September 14th, 1934. (459317.)

26126. "Vapour arc convertors." General Electric Co., Ltd., and E. Gallizia. September 20th, 1935. (459558.)

26437. "Electric connectors for flexible cables." English Electric Co., Ltd., and E. Barrie. September 24th, 1935. (459559.)

27114. "Short-wave wireless receiving apparatus." L. L. De Kramolin. October 1st, 1935. (459246.)

27359. "Processes and devices for electric-arc welding." M. Zack. June 11th, 1935. (Cognate application 27360-35.) (459247.)

27443. "Electrical inductances." Telephone Manufacturing Co., Ltd., and L. H. Paddle. October 4th, 1935. (Cognate application 5624-36.) (459389.)

27959. "Electric lamps." M. Hayashi. October 10th, 1934. (459248.)

28090. "Electric resistance alloys." British Driver-Harris Co., Ltd., and W. M. Kay. October 12th, 1934. (459390.)

28091. "Electric resistance alloys." British Driver-Harris Co., Ltd., and W. M. Kay. June 14th, 1935. (459319.)

28242. "Electrical resistances." A. Beetlestone, F. Waterton and Metropolitan-Vickers Electrical Co., Ltd. October 12th, 1935. (459391.)

28372. "Electric wire or cable." W. T. Henley's Telegraph Works Co., Ltd., H. A. Tunstall, and B. B. Evans. October 15th, 1935. (Cognate application 20644/36.) (459392.)

28502. "Electric-discharge devices." General Electric Co., Ltd., and V. J. Francis. October 15th, 1935. (459393.)

28503. "Electric-discharge devices." General Electric Co., Ltd. (Patent-Treuhand Ges. für Elektrische Glühlampen). October 15th, 1935. (459250.)

28752. "Modulation meter for modulated carrier waves." F. C. Williams. October 17th, 1935. (459563.)

29339. "Multiple filament incandescent electric lamps." A. Hoessle. October 26th, 1934. (459396.)

29355. "Electric contact-making switches." General Electric Co., Ltd., and W. R. Rose. October 24th, 1935. (459397.)

30082. "Circuits containing thermionic and like amplifiers." General Electric Co., Ltd., G. W. Edwards and D. C. Espley. October 31st, 1935. (459251.)

30344. "Scanning means and method." Farnsworth Television, Inc. November 5th, 1934. (459400.)

30588. "Two-motion switches such as are used in telephone systems." Mix & Genest Akt.-Ges. November 5th, 1934. (459322.)

31420. "Electric-discharge lamps." General Electric Co., Ltd. (Patent-Treuhand Ges. für Elektrische Glühlampen). November 13th, 1935. (459323.)

31862. "Electro-magnetic switches of the type used in telephone systems." General Electric Co., Ltd., and J. Eriksen. November 18th, 1935. (459254.)

32652. "Electric-discharge lamps." General Electric Co., Ltd. (Patent-Treuhand Ges. für Elektrische Glühlampen). November 25th, 1935. (459402.)

33871. "Wireless receiving sets." General Electric Co., Ltd., and J. O. Ackroyd. December 6th, 1935. (459568.)

34621. "Electrically heated hot-plates." General Electric Co., Ltd., and O. W. Humphreys. December 13th, 1935. (459570.)

35347. "Circuit arrangement for interconnecting teleprinters." C. Lorenz Akt.-Ges. December 21st, 1934. (459465.)

35445. "Electrical purification of gases." V. Beran. December 22nd, 1934. (459408.)

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1092. "Arrangements for controlling the flow of current for short periods of time in electric circuits." British Thomson-Houston Co., Ltd. January 14th, 1935. (459572.)

2136. "Electro-magnetic relays." General Electric Co., Ltd., and W. R. Rose. January 23rd, 1936. (459412.)

3843. "Translucent material impermeable to ultra-violet rays and the production thereof." O. Gerngross and A. Callo. February 7th, 1936. (459335.)

4133. "Electric capacitance devices." British Thomson-Houston Co., Ltd. February 15th, 1935. (459258.)

6417. "Television receivers." C. Lorenz Akt.-Ges. March 18th, 1935. (459260.)

8117. "Electric motor control systems." Igranic Electric Co., Ltd. March 25th, 1935. (459419.)

9141. "Scanning apparatus for television receivers." Radioakt-Ges. D. S. Loewe. March 29th, 1935. (459422.)

9620. "Vacuum-tight seals for electron-discharge devices." Westinghouse Electric & Manufacturing Co. April 24th, 1935. (459469.)

11733. "Fans." British Thomson-Houston Co., Ltd. April 26th, 1935. (459425.)

12560. "Electrical band-pass filters for wireless receiving sets." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. July 26th, 1935. (459343.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from January 28th:—

Wolf. No. 572355. Class 6. Portable electrical machines for grinding, drilling, sanding, blowing, brushing, polishing, filing, sawing and nut-setting.—S. Wolf and Co., Ltd., Hanger Lane, Ealing, W.5.

Micarta. No. 573862. Class 6. Machinery of all kinds and parts of machinery.—Westinghouse Electric and Manufacturing Co., East Pittsburgh, Penn., U.S.A. (British representative: G. R. Shepherd, 2, Norfolk Street, Strand, W.C.2.)

Ridgmount. No. 573757. Class 8. Television transmitting and receiving apparatus, sound reproduction and recording apparatus, wireless-telephonic and telegraphic apparatus, &c.—John E. Dallas and Sons, Ltd., Dallas Buildings, Ridgmount Street, W.C.1.

Nicrex. No. 572472. Class 13. Filler rods and electrodes for use in electric arc welding, all being metal goods.—Murex Welding Processes, Ltd., Forest Road, Walthamstow, E.17.

Decel (lettering and design). No. 572669. Class 40. Goods manufactured from india-rubber and gutta-percha.—Durham Cables, Ltd., Birtley, Co. Durham.

Nixin. No. 572021. Class 50. Insulating parts of electric lighting, heating and power fittings, all made of synthetic resin or of synthetic resin with other insulating materials.—Walter Jones, Ltd., Africa House, Kingsway, W.C.2.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberfoyle (PERTHSHIRE).—Conversion of mansion house into hotel (£15,000); R. A. Scrymgeour, architect, 7, Ward Road, Dundee.

Alnwick.—Houses (22), Lesbury; R.D.C. surveyor.

Ayr.—Houses (44), Newton Green (£16,462); burgh surveyor.

Beckenham.—School, Shortlands, for E.C.

Bedfordshire.—Junior school, Dunstable, and alterations and extensions to senior school, Dunstable, for C.C.; county surveyor, Shire Hall, Bedford.

Birkenhead.—Cinema on the site of Scala Cinema, Argyle Street (2,050 seats), for the Associated British Cinemas, Ltd.

Birmingham.—Houses, Hall Green (£17,357), and Kettlehouse estate (£82,655), modernisation of Erdington institution (£306,245), and underground car park, Civic centre (£85,000); city engineer. Buildings for the Birmingham Settlement, 318, Summer Lane and 310, Kingstanding Road (£42,000), with electrical work; T. M. Ashford, architect, 3, Great Charles Street. Factory, Emily Street, for Rainsford & Lynes, Ltd. (£25,000), with electrical work; W. J. Whittall & Son, builders, Lancaster Street.

Bispham.—Cinema, Red Bank Road; R. C. Walsh, architect, Weymouth Road, Blackpool.

Bolton.—Houses (250), Long Lane; housing director. Bus station, Moor Lane, and Mental hospital buildings; borough engineer.

Bournemouth.—Houses (29), Durrington Road; J. N. Hardy. Flats (37), Norwich Avenue; Clulow & George. Shops and flats, Christchurch Road; Elcock & Co. Showroom and flats, Stevenson Avenue; W. C. Bowles.

Bramhall (STOCKPORT).—Cinema and café (£35,000), for the Marks' Circuit Cinemas, Manchester.

Buckhaven (FIFESHIRE).—Extensions to Cameron Hospital (£50,000); W. Williamson, architect, Leven.

Chertsey.—Cinema, London Street; H. Weston.

Cheshire.—School, Moss Lane, Sale (£33,767), for County E.C.

Colchester.—Fire station, Cowdray Avenue; H. Collins, borough engineer.

Croydon.—Extensions to factory for Nuleaf, Ltd., Rosecourt Road, Mitcham Road.

Darlaston.—Cinema, Wolverhampton Road, Bentley; R. Satchwell, architect, 6, New Street, Birmingham.

Darlington.—Premises, three storeys high, North Northgate, for Doggarts, Ltd.; G. Dougill & Sons, builders, Chestnut Street, Darlington.

Derby.—Houses (60), Borrowash, near Derby, for Prior Park Estate (Derby), Ltd., 56a, Mosley Street, Manchester.

Dover.—Houses (23), Tower Hamlets; S. Vallintine.

Dudley.—Houses (342), Bowling Green estate; borough engineer. Six shops and flats, Castle Hill; Gerald Trust, Ltd.

Durham.—Schools, Bleach Green, Blaydon-on-Tyne, West Pelton and Pelton-Newfield, for County E.C.; county architect, 34, Old Elvet, Durham.

Ealing.—Factory, Aintree Road, for Guerlain, Ltd., 48, Mortimer Street, London, W.1.

Eastcote.—Shops and flats, Field End Road; Murrell & Piggott, architects, 44, Bedford Row, W.C.1.

Edinburgh.—Premises for the National Library of Scotland (£200,000); R. Fairlie, architect, 7, Ainslie Place.

Elmdon (WARWICKSHIRE).—Houses (60), Temple estate, for Edwin Jones & Co., New Street, Birmingham; C. W. Marshall, Ltd., builders, Old Station Road, Henley-in-Arden.

Enfield.—Houses (36), Cedar Avenue; W. Goodchild & Co. Houses (24), Vera Avenue; New Ideal Homesteads. Flats (120), near Nursery Road; McManus & Co., Ltd. Shops and flats, Great Cambridge Road; L. R. Badcock.

Esher.—Development of site (12 acres) for houses, Hinchley Wood; U.D.C. surveyor.

Fleetwood.—Houses (150) and shops, near Broadway and Fleetwood Road; R. Fielding & Sons, Ltd., builders, Stanhope Road works, Blackpool.

Friern Barnet.—Council offices; C. Cowles-Voysey, assessor.

Guildford.—Houses (68), Hill View estate, Aldershot Road; H. Ashenden. Factory, Bye Pass Road; Twentieth Century Leather Co. Shops, Epsom Road and London Road; Herring, Son & Daw, 100c, Queen Victoria Street, E.C.4.

Hampshire.—School, Farnborough (£26,298), for County E.C.

Hanley (STOKE-ON-TRENT).—Block of shops, Saracen's Head Hotel site, Hanley; Venables and Barker, architects, Gordon Chambers, Cheapside, Hanley.

Harrow.—Shops, Station Road; Morris Estates, Ltd., 14, Regent Street, London, S.W.1.

Hastings.—Houses (52), Broomgrove site; S. Little, borough engineer, Wellington Square.

Hawarden (CHESTER).—Houses, Aston Bank and Tryddyn; Roberts & Wycherley, builders, Wrexham.

Hereford.—School, Whitecross; W. Robinson, architect.

Hull.—General hospital, Eppleworth Road, Cottingham; D. Harvey, city architect, Guildhall. Houses (984) and three schools; city architect.

Ilford.—Public library (£13,618); borough engineer.

Kent.—Three schools, Dartford, for County E.C.

Lancaster.—Baths (£59,475); borough engineer.

Leeds.—Offices (£50,000), for the River Ouse (Yorkshire) Catchment Board. Houses (1,500). Middleton Park estate; housing director. Cinema and library, Meanwood Park Colony; city architect.

Liverpool.—Houses (267), Thingwall Farm estate; Milton Estates, Ltd., Fiveways, Queen's Drive. Houses (120), Thingwall Farm estate; Paramount Estates, Ltd., 112, Upper Warwick Street.

London.—(BATTERSEA).—Extensions to Sir Walter St. John's school (£12,725); Hudson Bros. (Builders), Ltd., 207, St. John's Hill, S.W.11. School, Linda Street, for L.C.C.; T. S. Tait, architect, Gate House, Wyldes Close, N.W.11. (BERMONDSEY).—Flats, Stansfield Street area (£13,373), shops and warehouses, Elephant Lane area (£21,614); borough engineer. (CAMBERWELL).—Dwellings, Sumner Road area (£90,000); R. J. Rowley, Ltd., Belmont Works, Belmont Avenue, N.17. (GREENWICH).—Houses (1,000), Cottage estate, Kidbroke Way; L.C.C. architect. (HACKNEY).—Tenements (163), Stamford Hill estate (£29,174); W. J. Simms, Sons & Cooke, Ltd. (HAMMERSMITH).—Shops, Old Oak Common Lane; Marshall & Tweedy, 9, Cavendish Street, W.1. Extensions to Cadby Hall; Holman & Goodrham, 9, Kings Bench Walk, E.C.4. (LEWISHAM).—Houses (22), Wells Park Road; Nursery Estates, Ltd., 1a, Wickham Court Road, West Wickham. (LEYTONSTONE).—Converting homes to mental institution (£48,600); L.C.C. architect. (PADDINGTON).—Dwellings, Chippenham Road area (£47,595); borough engineer. Shops and flats, Harrow Road and Wharf Road; Percy Clarke & Son, 5, Arundel Street, W.C.2. (POPLAR).—Rebuilding factory, Albion Wharf; R. S. Andrews, 135, Bow Road, E.3. (WAPPING).—Remodelling of St. Georges Hospital (£17,647); Triggs & Co., Ltd., Lambourn Works, Mackay Road, S.W.4. (WANDSWORTH).—Factory, Dursthill Road, Springfield; Roddick, Colvin & Clark, surveyors, 3, Gt. James Street, W.C.1.

Manchester.—Houses (330), Mersey Bank estate; W. J. Simms Son & Cooke, Ltd. Methodist church, Timperley; F. Chippendale, architect, Kurna Moss Lane, Timperley. School, Moston Fields (£16,114); city architect.

Mansfield.—Houses, Norbury Drive; J. P. Smith.

Market Drayton.—Houses (40), Kiln Bank; W. Brammar & Co., builders, 28, Longfield Road, Hartshill, Newcastle, Staffordshire.

Milford Haven.—Premises, Charles Street, for F. W. Woolworth & Co., Ltd., 1, New Bond Street, London, W.1.

Monkseaton (NORTHUMBERLAND).—St. Peter's Church, Cauldwell Lane; Rev. E. Jackson, vicar, 2, Beverley Road.

Newcastle-on-Tyne.—Houses (24), Heathwell Road; Oliver & Leeson, architects, Ellison Place.

Newmarket.—Houses (20), Burwell; H. J. Ewers, Hoddesdon.

Oldbury.—Houses (44), near George Road; S. Spollen. Houses and shops, Rood End Road; I. J. Clamp. Extension to factory, Albert Street; J. W. Naylor & Sons.

Raunds.—Extensions to factory for E. C. Gravestock (Raunds) Ltd., Midland Road.

Rotherham.—Cubicle block and operation theatre, &c., isolation hospital (£21,200), with electrical work; city architect.

Rowley Regis.—Houses (500), Throne Road estate; S. A. Griffiths, architect, 87, High Street, Stourbridge. Municipal Buildings, Old Hill (£32,496), with electrical work; J. M. Tate & Sons, builders, Cradley Heath. School, Darbys Hill and City Road, Tividale; Pritchard Godwin & Clist, architects, Bank Buildings, Kidderminster.

St. Helens.—School, near Prescot Road, for the Catholic Authorities; W. Ellis, architect, Union Bank Buildings, Hardshaw Street.

Sheffield.—Cinema, Chesterfield Road; Wilcockson & Cutts. Cinema, Norfolk Street; Odeon Theatres, Ltd., 49, Park Lane, London.

Solihull.—Houses (30), fronting Lode Lane; Price & Son, builders, 193, Station Road, Stechford, Birmingham.

Southall.—Seven shops and flats, Lady Margaret Road; Lansdowne Property Co., Ltd., The Sweep, Clapham Common, S.W.4.

Southend-on-Sea.—School, Carlton Avenue, for E.C.; F. W. Smith, architect, Municipal Buildings.

Southport.—Reconstruction of the Coliseum Cinema, Neville Street, for Coliseum Cinema (Southport), Ltd., 3, Tulketh Street; G. Tonge, architect, National Provincial Bank Buildings, Lord Street.

Stoke-on-Trent.—Houses, near Uttoxeter Road; F. Gibson.

Stornoway.—Houses (70); A. N. Tannahill, burgh surveyor, Municipal Buildings.

Stratford-on-Avon.—Houses (32), Alcester Road; F. W. Jones, surveyor, Municipal Offices.

Sutton-in-Ashfield.—Houses (50); Warner & Dean, architects, Mansfield Road.

Teddington.—Reconstruction of the Savoy Cinema for the Associated British Cinemas, Ltd., 30, Golden Square, W.1.

Thetford.—Houses (22); S. Wearing, architect, Norwich.

Tottenham.—Factory, Fountayne Road; Mills Equipment Co.

Tynemouth.—School, Waterville Road; borough engineer.

Urmston.—Houses (419), Humphrey Park estate, and shopping centre, Stretford Road; Longworth & Taylor, builders, 6, Humphrey Park.

Warrington.—Houses (31), Fife Road; Perdue & Whitfield.

Welton (LINCS).—Houses (52); F. L. Leach, R.D.C. surveyor, Clasketgate, Lincoln.

West Bromwich.—Transport depôt (£33,000); borough engineer.

Whitby.—Bus station for the United Automobile Services, Ltd., Darlington.

Whitehaven.—School (£15,911), for E.C.

Wood Green.—Hospital, Gordon Road; John Farrer & Sons, 7, Norfolk Street, W.C.2.

York.—Houses (400), Acomb estate; city engineer. Shops and offices, Parliament Street; W. Dove.

Yorkshire.—School, Clifton, for County E.C.